Version 1.2

F/A-18C Cockpit version 3.0

User manual

Add-on created by

Aeyes
Qawa
JanHas

for FreeFalcon5 on Falcon 4.0
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WWW.COCKPITS.NL

U.S. Navy photo by Mass Communication specialist 1st Class John M. Hageman

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CHAPTER 1: Installation instructions and features

2D and 3D fully clickable widescreen Cockpit in 1920 x 1200 resolution.
This version is intended for Falcon 4.0 with Freefalcon 5.

Installation

Step 1 - Run the FA18C_v3.0 installer.
Step 2 - Select install, reinstall completely or look for update.
Step 3 - Start Falcon and select an F/A-18C Hornet to fly

Settings

These are recommended settings, with and without use of TrackIR:
Step 1 - Run the FFViper Config Editor in your FreeFalcon5 dir
Step 2 - Point it to your FreeFalcon5/FFViper.exe
Step 3 - Go to 'Cockpit settings'
Step 4 - 3Dcockpit FOV – Set to 60 (Default)
Step 5 - Color MFD's – disable
Step 6 - Click Apply

Features and tips

2D cockpit:

Graphics

This install allows autoscaling, therefor it is possible to fly in lower resolutions like 1680 x1050 or 1440x900. The default resolution is 1920x1200.
Photorealistic cockpit with as real as possible functionality, within the limits of the Falcon simulator software.

ADI

The left DDI has a digital ADI, to be enabled on the HI/MPCD (Horizontal Indicator/Multi Purpose Color Display).

Kneeboards

The right kneeboard has 12 pages of browsable checklists for preflight and rampstart, ETR (Enemy Treat Ranges), refueling checklist, landing checklists.
The left kneeboard is disabled, FF5 allows multiple kneeboards.

HI/MPCD (Horizontal Indicator/Mulitipurpose Color Display)

Has a moving map in the center, it can be enabled by pushing the L4MAP button.
Has a digital HSI function, enabled by selecting the left upper knob and setting it to NORM.
Has a full 3rd display for various data, mainly used as FCC page for Situational Awareness.

Nightlighting

On the Internal Lights panel at the right down side you can enable floodlight by selecting either the FLOOD switch or the FLOOD BRT knob.
For enabling Instruments lights and backlit panels you hit keys Shift-2 and you turn the 'CONSOLES' knob to BRT.

Extra functionality panel

When keys Shift-1 are selected you will get a panel with extra large HUD/display data, and complete functionality for handling the DED content and navigation.

Rampstart

A full rampstart is possible, complete checklists on the right knee. Note that double engine rampstart is broken in current Red Viper version.
FF5 allows double engine rampstart again.

Brevity codes

Checklists, clicking down twice from the 12 o'clock view will bring you to a large and complete NATO brevity code list for accurate communications.

3D cockpit:

Functionality

Fully clickable (although most switches will not move) and gauges/instruments operational. See chapter 2 for a full functionality description.

Pilot animations

The pilot moves his legs to change rudder positions, the right arm moves the stick and the left arm moves the throttle.
When the thottle is in IDLE mode, the pilot will move his hand in his lap to enable a better view on the left consoles the 3D cockpit.

Canopy

Realistic Hornet canopy movements when opening and closing.

6DOF

6DOF TrackIR is recommended for full enjoyment.
If you don't have 6DOF enabled, open the 'Viper config editor' in the Falcon4 directory, go to 'Red Viper configuration', 'TrackIR settings', TrackIR DOF support, then enable 'Yaw pitch Roll,X Y Z' and click 'Apply'.

Mirrors

Although Falcon does not support real working mirrors, this add-on has basic reflective mirrors (non–image) depending on angle of sun shining into the cockpit.

Ejection

A completely new and higly detailed ejected pilot/parachute model and textures are included.

Aircraft model

Revamped external plane model with better animations and many improved model parts like a new refuelboom, new pilot, new slimelights, new canopy, new HUD, new cockpit interior.

Aircraft textures

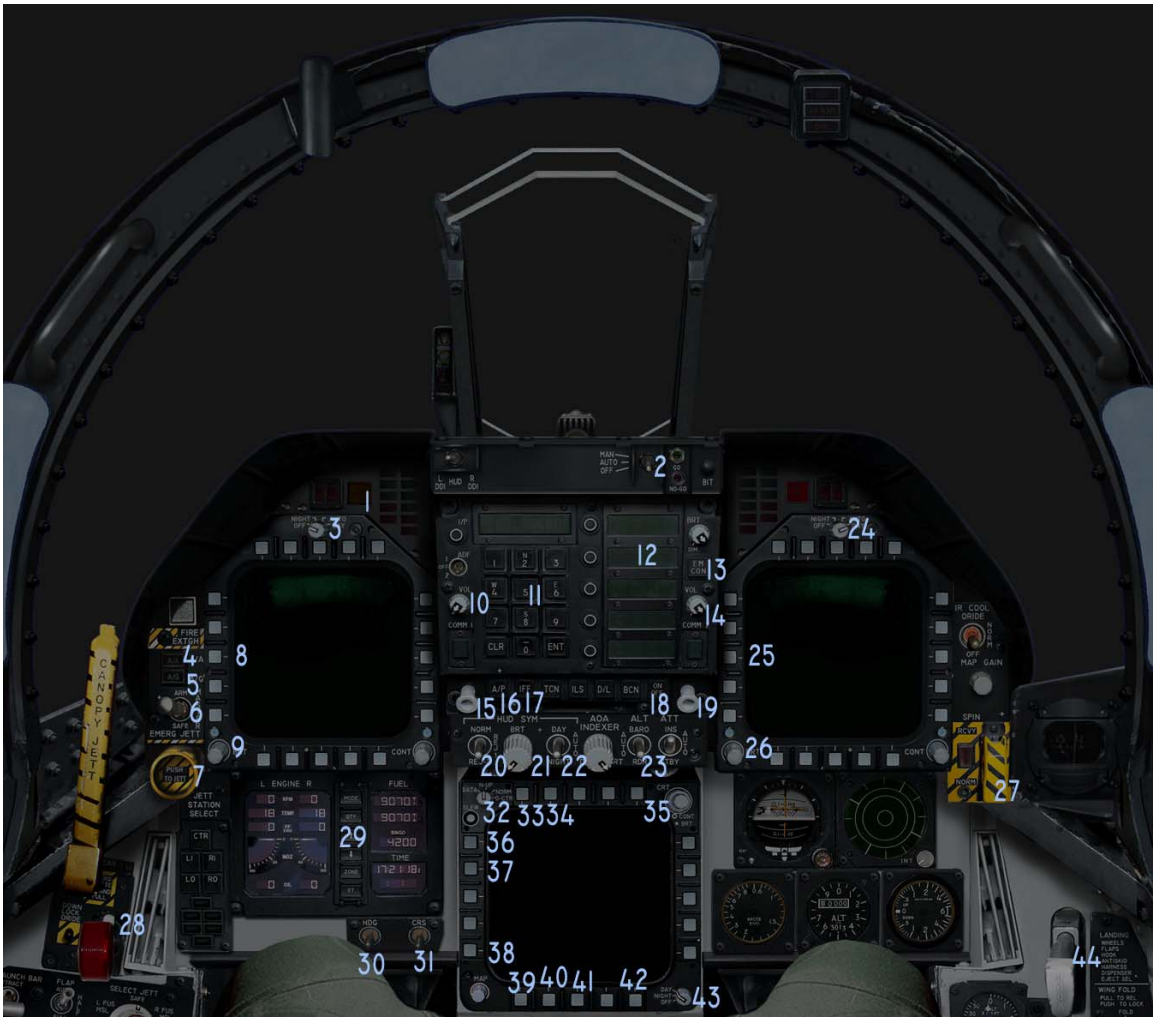
High quality textures for the exterior of the aircraft for both squadrons VMFA-232 and VFA-113.

CHAPTER 2: F/A-18C cockpit Funtionality description

Front panels objects

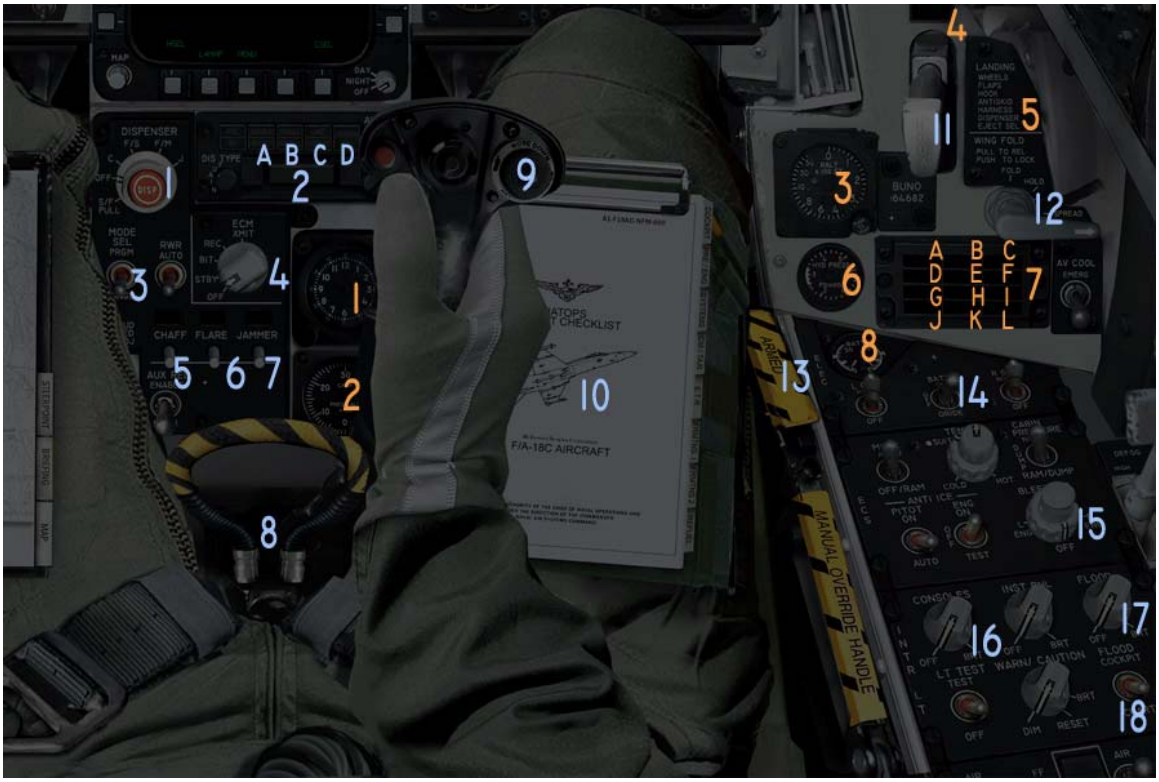
1) SHOOT and LOCK lights	10) Right engine FIRE light	19) Fuel Status Display
2) AoA lights	11) Left DDI	20) HI/MPCD
3) HUD (Head Up Display)	12) DED data	21) Backup ADI
4) Back up Aiming Reticle	13) Displays (Autopilot)	22) RWR
5) Left engine FIRE light	14) Comms 1 Channel	23) Backup Compass
6) Left side warning lights	15) Comms 2 Channel	24) Airspeed Instrument
7) Video recording ON/OFF lights	16) Right DDI	25) Altitude Instrument
8) Right side warning lights	17) GEAR/FLAPS lights	26) AoA Instrument
9) APU FIRE warning light	18) ENGINE status Display	

Front panels switches/knobs/buttons



1) Master Caution light disable	16) Autopilot states select	31) Course select switch
2) Set video recording switch	17) UFC IFF (DED)	32) HSI Power
3) Left DDI power ON	18) Autopilot states ON/OFF	33) SMS power
4) A/A selection	19) Comms Channel select	34) FCC power
5) A/G selection	20) HUD symbology Drift	35) FCC brightness
6) Master Arm switch	21) HUD brightness/power	36) Navigation/TCN modes
7) Emergency Jettison	22) HUD day/night mode	37) ILS TACAN modes
8) Left DDI pushbuttons	23) HUD radar ALT mode	38) AoA Instrument
9) L DDI brightness (Left side/Right side click)	24) Right DDI power ON	39) Heading select
10) Comms 1 volume	25) Right DDI pushbuttons	40) Moving Map select
11) UFC digits	26) R DDI brightness (Left side/Right side click)	41) Menu select (closes Map)
12) Autopilot in UFC displays	27) Spin recovery override	42) Course select
13) EMCON (Silent mode)	28) Landing gear handle	43) HI/MPCD power
14) Comms 2 volume	29) FUEL quantity select	44) Hook down lever
15) Comms Channel select	30) Heading select switch	

Front right side panels



Blue		
1) CM dispenser selection	5) CM Chaff power	13) Seat Arm handle
2) RWR modes	6) CM Flares power	14) Battery power select
a) Target separation /Offset	7) EWS Jammer power	15) Bleed Air select
b) Handoff / Special	8) Ejection handle	16) Consoles/Inst lights
c) Priority / limits	9) Trim pitch/roll (cross shape L and R click)	17) Flood light
d) RWR power	10) Browsable checklists	18) Flood chart light
3) CM modes	11) Wing spread/lock handle	
4) ECM select	12) HUD radar ALT mode	
Orange		
1) Clock	5) Landing checklist	
2) Cabin pressure gauge	6) Hydraulic pressure gauge	
3) Radar altitude instrument	7) Caution warning panel *	See below
4) HOOK light	8) Battery power	

*7) Caution warning panel	e) Gen Tie	j) L GEN
a) Seat not armed	f) LE Flaps Locked	k) R GEN
b) APU/ACC	g) Fuel Low	l) empty
c) Battery	h) FCES Avionics	
d) FCS HOT	i) empty	

Front left side panels

Blue		
1) Flares quick dispatch	11) Test MAL/IND/Betty	17) CM modes
2) Landing gear handle	12) Steerpoint mission data	18) ECM select
3) Launch bar extend/retract	13) Briefing mission data (disabled)	19) CM Chaff power
4) Flaps select	14) Moving Map Select	20) CM Flares power
5) Ground Jettison enable	15) CM dispenser selection	21) EWS Jammer power
6) Taxi/Landing lights	16) RWR modes	22) AUX REL (disabled)
7) Anti Skid ON/OFF(disabled)	a) Target separation /Offset	23) Ejection handle
8) Hook Carrier/Field select	b) Handoff / Special	
9) Parking brake/Emerg brake	c) Priority / limits	
10) Ext lights power	d) RWR power	
Orange		
1) Brakes Pressure gauge	3) Flaps indicator	5) Cabin Pressure
2) Left Kneeboard (disabled)	4) Clock	

Right side down panels

Blue		
1) Canopy Open/Close switch	6) Flood lights	11) R Hardpoints Arm power
2) Wing Spread/Lock handle	7) Instruments lights	12) L Hardpoints Arm power
3) Battery Power	8) Consoles lights Flood chart light	13) FCR power
4) Seat Arm handle	9) Flood chart light	14) INS power
5) Bleed Air select	10) FCS BIT	15) RADAR STBY/OPR
Orange		
1) Caution warning panel *	3) Battery power	5) L Hardpoints Arm power
2) Hydraulic pressure gauge	4) R Hardpoints Arm power	

*1) Caution warning panel	e) APU/ACC	j) FCS HOT
a) Battery	f) Gen Tie	k) Fuel Low
b) empty	g) FCES Avionics	l) L GEN
c) empty	h) R GEN	
d) empty	i) Seat not armed	

Left side down panels

Blue		
1) Oxygen Flow	9) Rudder Trim disc	17) Ext lights Anti-collision
2) TACAN digits selection	10) FCS reset	18) Flares quick dispatch
3) UFC power auto/manual	11) Refuel Probe extend/retract	19) Test MAL/IND/Betty
4) IFF power	12) Fuel master/Norm	20) Hook Carrier/Field
5) Threat Warning volume	13) Fuel engine feed /Norm	21) Taxi/Landing lights
6) Missile Warning Volume	14) Fuel wing first	22) Parking brake
7) Crank Engine L/R	15) Ext lights Position	
8) APU	16) Ext lights Strobe	
Orange		
1) Oxygen gauge	3) APU light	
2) TACAN digits	4) Brake Pressure gauge	

Detailed panels

Warning Lights from left to right	
FIRE	Left engine fire warning
MASTER CAUTION	Master Caustion light, push to set OFF
GO / NOGO	Proceed with flight advisory light
L BLEED/R BLEED	Air Bleed Left and Right
SPD BRK	Speed Break Air
STBY	Stand by
L BAR	Launch Bar extended
XMIT	Exmitting of Electronic countermeasures
RCDR ON	HUD camera recording ON
DISP	Limited or no CHAFF/FLARES available
AI	RWR activity alert light
SAM	Surface Air Missile launch warning
APU FIRE	APU fire warning
FIRE	Right engine fire warning

HI/MPCD (Horizontal Indicator/Multipurpose Color Display)	
Blue	
1. NORM	- Switches HSI ON and OFF
2. SMS	- Stores Management Power
3. FCC	- Switches FCC ON and OFF
4. Left side, left mouse BRT	- DIMS FCC data
5. Right side, Right side mouse BRT	- FCC data Brightness
6. NAV/ TCN	- Navigation/Tacan modes
7. ILS / TCN	- ILS TACAN modes
8. ADI	- Enables digital ADI on DDI 1
9. HDG	- Heading selection
10. L4MAP	- Enables Moving map display
11. MENU	- Disables Moving map display
12. CRS	- Course selection
Orange	
1. Moving map	
2. HSI	
3. FCC data	
4. Heading digits	
5. Course digits	

Chapter 3 CHECKLISTS

PREFLIGHT CHECKLIST	
1. Harness and rudder pedals	- SECURE/ADJUST
2. OXY flow knob	- OFF
Left console -	
1. Circuit breakers (4)	- IN
2. Manual canopy handle	- STOWED
3. Mission computer and hydraulic isolate switches	- NORM
4. UHF/IFF antennas	- AUTO/BOTH
5. Communication panel	- SET
a. Relay, cipher, G xmit	- OFF
b. ILS	- SET FREQUENCY / UFC
c. Master switch	- NORM
d. Mode 4 switch	- OFF
e. Crypto switch	- SET
6. Volume control panel	- SET
7. GEN TIE control switch	- NORM (Guard Down)
8. Gain switch	- NORM
9. Refuel probe switch	- RETRACT
10. External tanks switches	- NORM
11. Dump switch	- OFF
12. Internal wing switch	- NORM
13. External lights	- SET
14. Throttles	- OFF
15. Parking brake	- SET
16. Landing/taxi switch	- OFF
18. Flap switch	- HALF
19. Selective jettison knob	- SAFE
20. Landing gear handle	- DOWN
21. canopy Jettison handle	- FORWARD

Instrument panel -	
1. Master arm switch	- SAFE
2. FIRE and APU FIRE warning lights	- NOT PRESSED
3. DDI, HI, and HUD	- OFF
4. Altitude source	- SELECT
5. Attitude source	- AUTO
6. Comm 1 and 2 knobs	- OFF
7. ADF switch	- OFF
8. ECM mode	- OFF
9. Dispenser selector/Dispenser switch	- OFF
10. Auxiliary release switch	- NORM
11. Clock	- NORM
12. IR coolant switch	- OFF
13. Spin recovery switch	- GUARD DOWN/OFF

Right console -	
1. Circuit breakers (4)	- IN
2. Arresting hook handle	- UP
3. Wing fold handle	- SAME AS WING POSITION
4. FCS cool switch	- NORM
5. Radar altimeter	- OFF
6. Generator switches	- NORM
7. Battery switch	- OFF
8. ECS system	- SET
a. Mode switch	- AUTO
b. Temperature knob	- 10 O'CLOCK
c. Cabin pressure switch	- NORM
d. Bleed air knob	- NORM and DOWN
e. Engine anti-ice switch	- OFF
f. Pitot anti-ice switch	- AUTO
g. Defog handle	- MID RANGE
9. Windshield anti-ice switch	- OFF
10. Interior lights	- AS DESIRED
11. Sensors	- OFF
12. KY -58 panel	- SET

STARTUP CHECKLIST	
Engine start	
1. Battery operation	- CHECK
a. Battery switch	
b. Emergency BATT voltage	- CHECK
Check for minimum voltage of 23.5 volts	
c. Battery switch	
d. Utility BATT voltage	- CHECK
Check for minimum voltage of 23.5 volts	
2. Fire warning	- TEST
Observe left and right FIRE, APU FIRE, L BLEED and R BLEED lights. Hold test switch in position until all voice alerts are heard.	
SHOW ENGINES OVERLAY TEXT	**Keys Shift-CTRL-H**
3. APU switch	- ON
(READY light within 30 seconds)	
SELECT LEFT ENGINE	**Keys CTRL – O (not the digit 0)**
4. Set Left throttle from OFF to	- IDLE (20% RPM minimum)
5. Engine crank switch	- L
6. DDI, HI/MPCD, HUD, UFC avionics	- ON
a. Set DDI power	- DAY
b. Set HUD power	- Turn BRT
c. Set FCC on HI/MPCD	- PUSH
d. Set SMS on HI/MPCD	- PUSH
7. EMI/IFEI	- CHECK
a. After engine start, it may be necessary to advance power above idle to get the ECS turbine started	
b. Bleed Air knob	- CYCLE THRU OFF TO NORM
SELECT RIGHT ENGINE	**Keys CTRL – O**
8. APU switch	- ON
9. Set Right throttle from OFF to	- IDLE (20% RPM minimum)
10. Engine crank switch	- R
SELECT BOTH ENGINES	**Keys CTRL – O**
11. Engine crank switch	- CHECK OFF
HIDE ENGINES OVERLAY TEXT	**Keys Shift-CTRL-H**

WEAPONS/SENSORS	
1. Set left and right hardpoints	- ON
2. Set Dispenser selector to required program	
a. OFF	- Dispenser disabled
b. C	- STBY (Manual programming)
c. F/S	- SEMI (automatic launch based on program)
d. F/M	- MAN (manual launch)
e. J	- AUTO (automatic jamming and launch)
3. RWR	- POWER ON
4. MODE SEL PRGM	- As Required
5. CHAFF power	- PULL
6. FLARES power	- PULL
7. JAMMER power	- PULL
8. ECM	- As Required

Return to the default 12 o'clock view, push keys Shift-1 and enable the DED (from OFF to ON), Push keys Shift-1 again and proceed further.

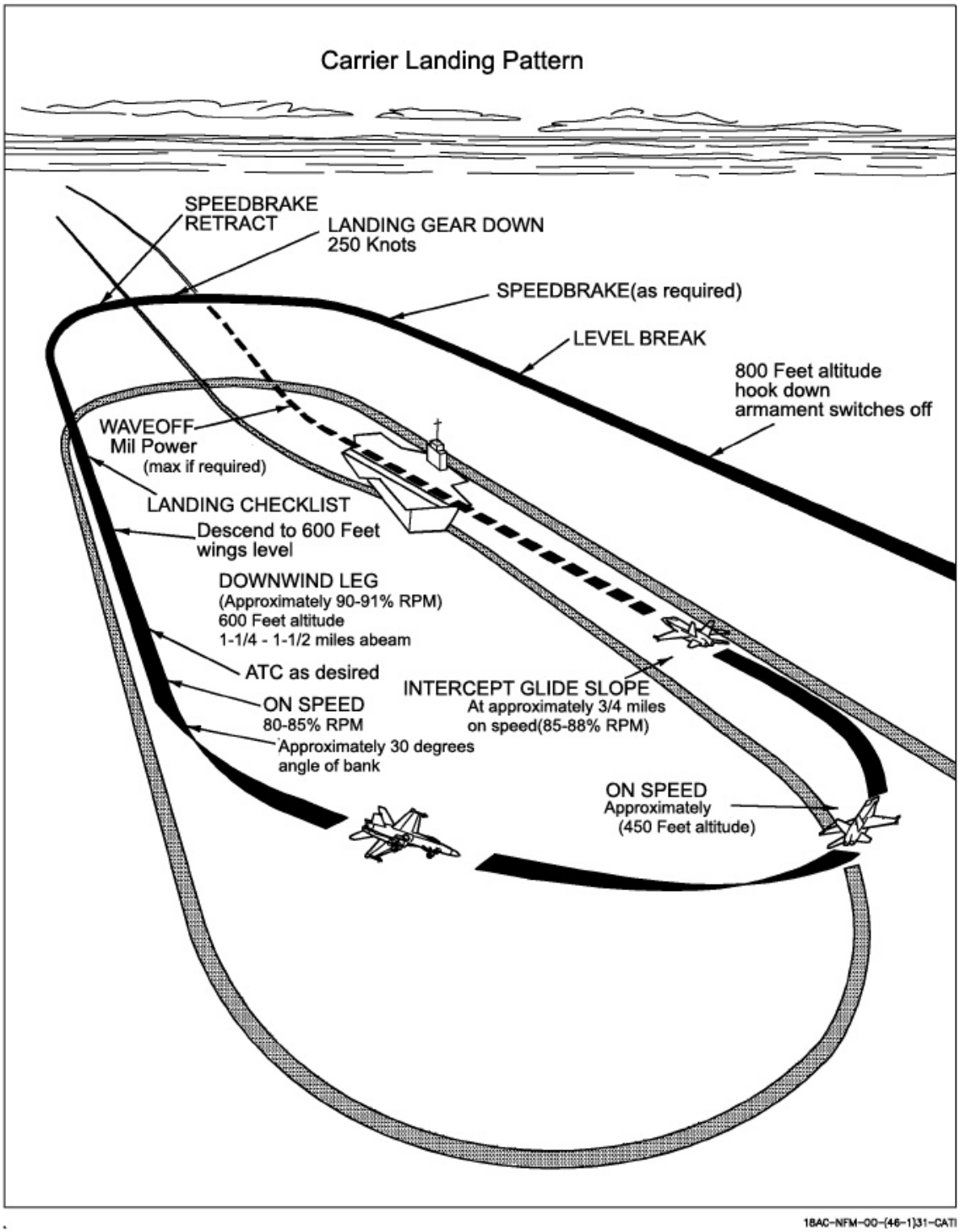
BEFORE TAXI	
1. Waypoint zero	- Check
2. INS	- CV/GND
3. Radar	- STBY
4. Wingfold	- SPREAD and LOCK
5. FCS RESET button	- Push
6. OXY flow knob	- ON
7. APU	- Verify OFF
8. Fuel	- BIT/Set BINGO
9. Altimeter	- Set
10.Radar	- Set OPR
TAXI	
1. Normal brakes	- CHECK
2. Nosewheel steering	- CHECK

BEFORE TAKEOFF	
1. Canopy	- CLOSED
2. IFF	- ON
3. Inertial Navigation System	- CHECK
On aircraft with and without GPS, after alignment is complete, select NAV	
4. Parking brake handle	- FULLY STOWED
5. MENU checklist	- COMPLETE
6. Engines	- MIL CHECK
CATAPULT HOOKUP AND TAKEOFF	
1. External Fuel Quantity	- CHECK (QTY)
2. Launch Bar	- EXTEND
3. Brakes on signal	- RELEASE
4. Throttle	- 85-90% RPM
5. Throttle On Final Turnup signal	- MIL/MAX
6. Flight controls	- CYCLE
7. Warning/Caution lights OFF	- CHECK
8. Engine instruments	- CHECK
9. Launch Bar	- RETRACT
10. TAKE OFF	

Air Refueling Checklist	
Visor recommended down	
1. Radio	- Request refuelling
2. TACAN	- Select TCN channel (Texaco)
3. Radar	- STBY/SILENT/EMCON
4. Master arm switch	- SAFE
5. Heading	- Course to Intercept (HSI)
6. Altitude	- Tanker ALT - 1000 ft
7. Air refuel probe	- EXTEND
8. Pre-contact	- Check RDY in HUD
9. Boom Operator	- Follow Instructions and lights
10. Refueling	- Hold position
11. Fuel	- Check Fuel Transfer
12. Disc/Refuel Probe	- Retract
For night air refueling	
14. Exterior lights	- STEADY BRIGHT
15. Tanker lights	- AS DESIRED
Note: Tanker overtake speed	
Over 1Nm: 100 kts, 6000ft: 60 kts, 5000ft: 50kts	
Decrease overtake speed by 10 kts for every 1000ft of closure.	
When within 1000ft to tanker, do not exceed 10kts overtake !	

Carrier Landing Checklist	
1. Landing Aproach	- Enter the carrier landing pattern
2. Hook	- Down at 800ft altitude
3. Position	- Make Level Break to BRC
4. Speedbrake	- As required
5. Landing gear/flaps	- Down under 250 kts
6. Speedbrake	- Retract
7. Altitude	- Descend to 600ft
8. Checklist	- Complete Landing checklist (placard)
9. ATC	- As desired
10. Speed	- On Speed 85 - 88% RPM
11. Aproach	- Turn to final
12. Altitude	- Descend to 450ft
13. Meatball	- Transmit Callsign, Hornet, Ball or CLARA, Fuel state
14. Aproach	- Intercept Glide Slope
15. Speed	- On Speed 85 - 88% RPM
16. Touchdown	- Throttle to MIL power
17. Brakes	- Apply brakes on signal
18. Hook	- Raise on signal
19. Landing area	- Exit on Come Ahead signal
20. Wings	- Fold unless otherwise directed.

Landing pattern drawing



Chapter 4: CARRIER TAKEOFF

General information

The pilot drives the plane to a catapult which connects to the plane.
The catapult, which is powered by steam produced by the carrier's nuclear reactors, accelerates the plane quickly in the relatively short space along the flight deck.
When the pilot has applied full thrust from the plane's engines, he salutes the "plane captain" on the deck who returns the salute and kneels down and touches the deck.
That is the signal for the catapult to be activated.
The catapult officer can adjust the power of the catapult depending on the plane's mass, but in any event, the plane needs to have enough airspeed to be able to fly when it reaches the front end of the flight deck.
The carrier will generally turn to steer into the wind to give even more lift to the plane's wings during "flight operations".

U.S.Navy photo by Mass Communication Specialist 2nd Class Joseph M. Buliavac

Catapult Hook-Up

Before taxiing past the shuttle, aircraft gross weight should be verified, take-off checklist complete, and arming completed by the ordnance crew if required.
Check external fuel quantity.
Approach the catapult track slowly, lightly riding the brakes, with nosewheel steering on.
Use minimum power required to keep the aircraft rolling.
Close attention to the plane director’s signals is required to align the aircraft with the catapult track entry wye.

U.S. Navy photo by Mass Communication Specialist 3rd Class Torrey W. Lee

When aligned, the plane director signals the pilot to lower the launch bar.
Place the launch bar switch to EXTEND. The green LAUNCH BAR advisory light comes on and nosewheel steering disengages. Do not use nosewheel steering once the launch bar enters the track. The catapult crew installs the holdback bar and the aircraft may taxi forward slowly, following the signals of the plane director. When the launch bar drops over the shuttle spreader, the aircraft will be stopped by the holdback bar engaging the catapult buffer.
Upon receipt of the “Release Brakes” signal, advance throttles to 85% to 90% rpm.
Do not advance throttles to MIL at this time since this could retract the launch bar before it is trapped by the tensioned shuttle spreader.

U.S. Navy photo by Mass Communication Specialist 3rd Class Gary Prill

When the “Final Turnup” signal is received from the catapult officer, advance throttles to MIL or MAX. Place the launch bar switch to RETRACT.
Cycle the flight controls, wait 4 seconds then ensure all warning and caution lights are out. If afterburners are to be used, select them on signal from the catapult officer.
Check engine instruments. When satisfied that the aircraft is ready for launch, hold throttles firmly against the detent, place the head against the head-rest, and salute the catapult officer with the right hand.

Note: In Falcon Red Viper or Freefalcon 5 placing the Launch bar to Retract will launch the aircraft immediately due to limited carrier operations functionality.

Chapter 5: CARRIER LANDING

Carrier Landing Pattern description

- While maneuvering to enter the traffic pattern, attempt to determine the sea state. This information will be of value in predicting problems that may be encountered during the approach and landing.

- Enter the carrier landing pattern with the hook down.

- Make a level break from a course parallel to the Base Recovery Course (BRC), close aboard to the starboard of the ship.

- Below 250 knots lower the gear and flaps.

- Descend to 600 feet when established downwind and prior to the 180° position.

- Complete the landing checklist and crosscheck angle-of-attack and proper airspeed.

- With a 30-knot wind over the deck begin the 180° turn to the final approach when approximately abeam the LSO platform.

- When the meatball is acquired, transmit “Call sign, Hornet, Ball or CLARA, fuel state (nearest 100 pounds)

U.S. Navy photo by Mass Communication Specialist 2nd Class Shannon R. Warner

- Fly the aircraft on the glideslope and ON-SPEED all the way to touchdown.

- Advance the throttles to MIL as the aircraft touches down.

U.S. Navy photo by Mass Communication Specialist 2nd Class Ron Reeves

Note: In Falcon Red Viper of Freefalcon 5 the aircraft will stop on the carrier when pushing the flightstick fully forward after landing and arresting the cable due to limited carrier operations functionality.

- When forward motion has ceased reduce power to IDLE, allow the aircraft to roll aft.

- Apply brakes on signal.

- Raise the hook when directed.

- If the wire does not drop free, drop the hook when directed, and allow the aircraft to be pulled aft.

- Raise the hook again on signal.

U.S. Navy photo by Mass Communication Specialist 2nd Class Nathan Laird

- When the come ahead signal is received add power, release brakes, and exit the landing area cautiously and expeditiously.

- Fold the wings unless directed otherwise.

- If one or both brakes fail, utilize the emergency brakes, advise the tower and drop the arresting hook.

- Taxi the aircraft as directed. Do not use excessive power.

- Once spotted, keep the engines running until the CUT signal is given by the plane director and the minimum required number of chocks or tiedown chains are installed.

IFLOLS

IMPROVED FRESNEL LENS OPTICAL LANDING SYSTEM (IFLOLS)

The IFLOLS has a total of 12 vertical cells. This allows for exact glideslope information, and a high definition visual aid with a vertical coverage of 1.7 degrees, acquisition range is 1.5 nm.

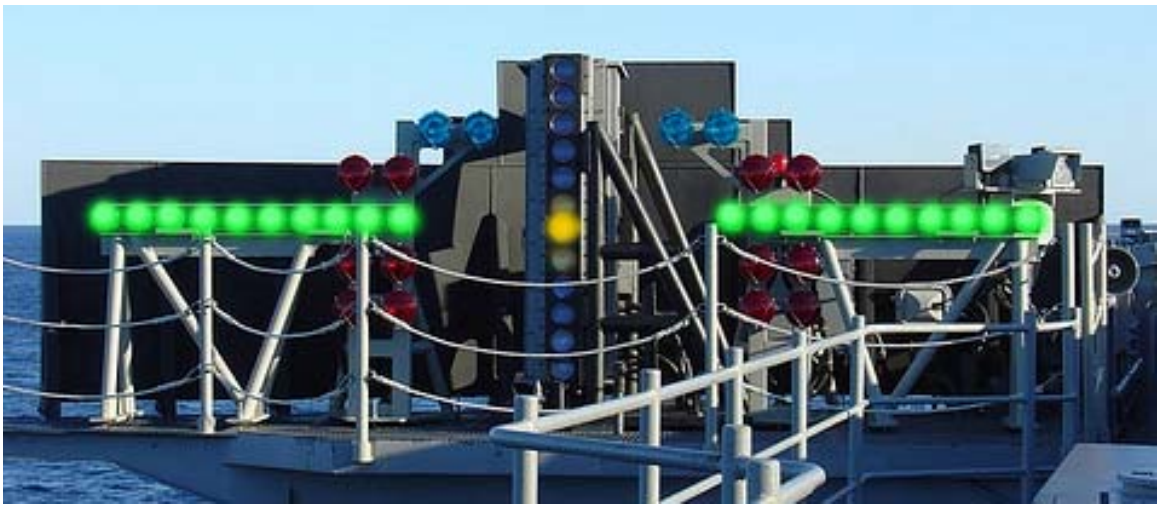
COMPONENT DESCRIPTION
The Fresnel lens consists of a lens assembly, “cut” lights, waveoff lights, and datum lights.

LENS ASSEMBLY
The lens assembly is a box containing 12 vertical light cells. Depending on your position on the glidepath, one of the amber cells or the bottom red cell is visible. The visible lens indicates your position relative to the glideslope, i.e., above, on, or below the optimum glidelsope.

CUT LIGHTS
Mounted horizontally and centered above the lens box are four green cut lights that initially indicate a “Roger ball” call to aircraft that are operating under “ziplip”, EMCON, or NORDO at the ship. Additional illumination of the cut lights is a call for power. Ziplip is normally used during day Case I fleet operations to minimize radio transmissions. EMCON is a condition where all electronic emissions are minimized.

WAVE-OFF LIGHTS
Wave-off lights are mounted vertically on each side of the lens box. These red lights are controlled by the Landing Signal Officer (LSO) and used to indicate that either the deck is foul or the approach is not set up properly or is unsafe.
“Bingo” is signaled by alternating wave-off and cut lights.

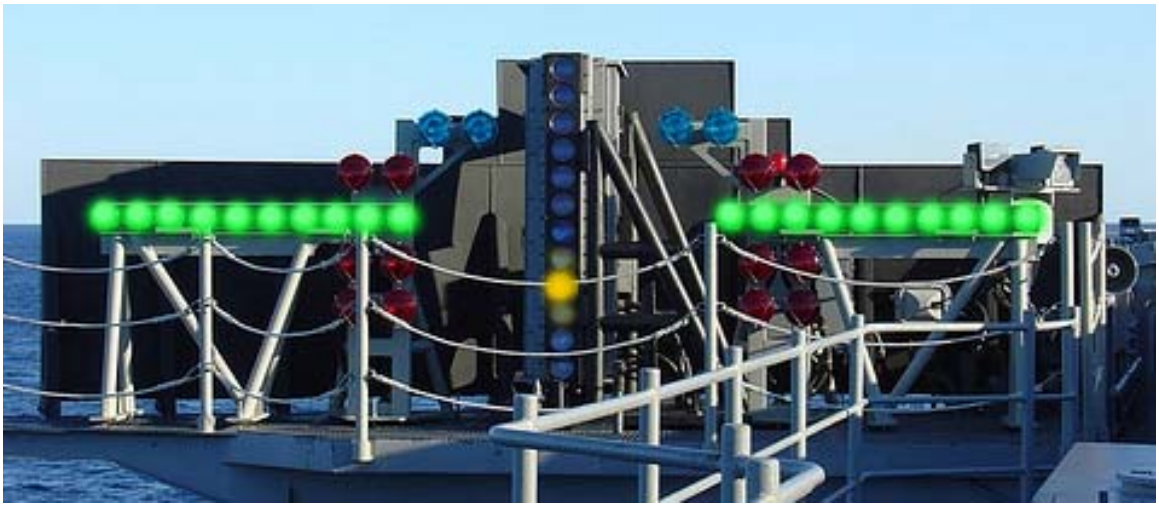
DATUM LIGHTS
Green datum lights are mounted horizontally to the lens assembly with ten lights on each side. The position of the ball in reference to the datum lights provides you glideslope information.



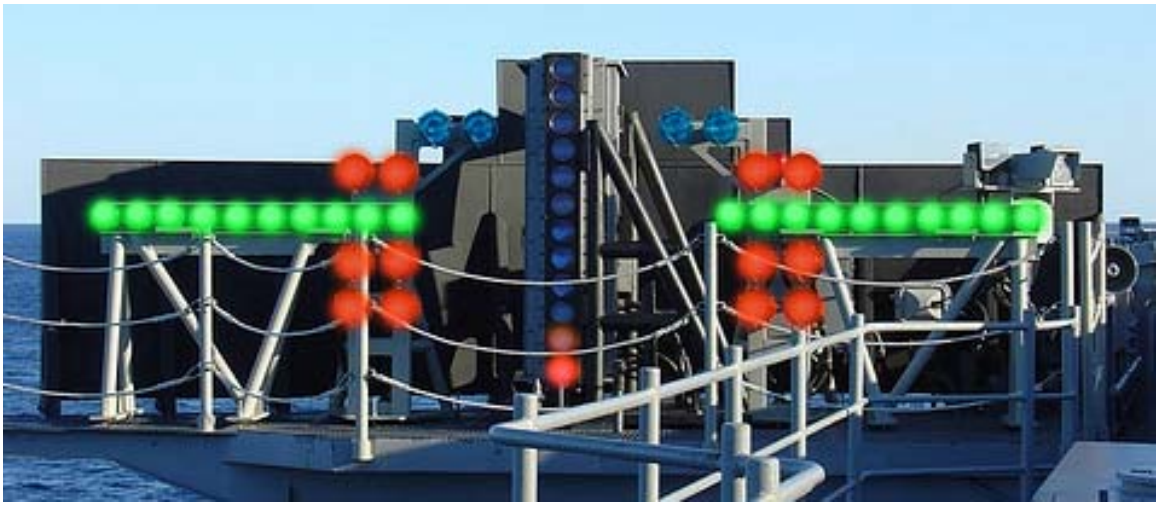
On the Ball

Too High

Way Too High



Too Low



Way Too Low, Waveoff

GLIDESLOPE AND AIRSPEED CORRECTIONS

You should correct any errors made immediately. The earlier you make a correction, the easier corrections and countercorrections will be.
The following list presents some glideslope/AOA deviations you can expect to see and the corrections required. Remember, the glideslope is wedge-shaped and becomes progressively narrower as you get closer to the runway, and you must decrease the magnitude of a correction for an equivalent amount of ball movement as you approach touchdown.

NOTE: All glideslope deviations will require a minimum of three corrections in order to regain optimum glideslope.

Over Powered

High
Reduce power to increase your rate of descent and adjust nose attitude to maintain optimum AOA. As the ball approaches the center, add power to reestablish and maintain the proper glideslope and readjust your nose attitude to maintain optimum AOA. Almost immediately following this countercorrection, a third adjustment will be required.

If the ball goes high in close or at the ramp, stop the movement but do not attempt to recenter the ball. Avoid the temptation to cut power or drop your nose when you are high or climbing in-close to at-the-ramp. Accept the high or take your bolter.
A large power reduction in close to at-the-ramp is referred to as a cut or ease gun. This condition is unsafe and is never an acceptable correction—a high “come down” will result in a hard landing, blown tires, and possible structural damage.

Fast
Reduce power. As the aircraft decelerates, coordinate an increase in nose attitude slightly to maintain a centered ball and work it back on-speed. Approaching optimum AOA, add power as necessary to maintain glideslope and readjust nose attitude to maintain optimum AOA. Again, you will have to make a third correction.

High and Fast
As in the high or fast approach, you must reduce power. As the ball approaches the center, increase nose attitude as necessary to correct back to optimum AOA. The aircraft approaches on-speed prior to regaining a centered ball. Adjust power to control your rate of descent and to maintain proper AOA.
As the ball approaches the center, use nose attitude and power to stabilize on the proper AOA and glideslope.

Under Powered

Low
Add power and adjust nose attitude to maintain optimum AOA. Once the ball is centered, reduce power to reestablish glideslope and readjust your nose attitude to maintain optimum AOA. Do not lead a low by reducing power prior to a centered ball.
An inevitable third correction is required to stabilize on glideslope. Never accept a low ball. Never finesse a low ball.

Slow
Add power. As the aircraft accelerates, decrease the nose attitude slightly to obtain optimum AOA and then readjust attitude to maintain AOA and reduce power to maintain glideslope. To stabilize glideslope, a third power correction is mandatory.

Low and Slow
Add power immediately. Maintain nose attitude while adding power. As the ball centers, prior to your regaining the proper AOA, decrease nose attitude to stay on glideslope until optimum AOA is reached. If the aircraft returns to on-speed while the ball is still low, adjust the nose attitude to maintain proper AOA while waiting for the glideslope correction to be completed. When the ball is centered, simultaneously adjust the nose attitude and reduce power to reestablish the proper rate of descent.
Add power and adjust nose attitude as necessary to stabilize the aircraft on glideslope and airspeed. A third power and attitude correction is required.

Power Ok

High and Slow
If the aircraft is not excessively slow, lower the nose attitude to initiate the correction. If you are excessively slow, you will have to add power. If your aircraft accelerates to on-speed prior to the ball reaching the center, a small power reduction is necessary. If the AOA continues to indicate that you are slow, add power, and as the ball approaches the center, accelerate your aircraft to the proper AOA.

Low and Fast
Raise the nose to start the ball coming up and decelerate to optimum AOA. If the aircraft slows to on-speed prior to the ball being centered, add power and maintain on-speed. When the ball is centered, reduce power to reestablish glideslope and adjust nose attitude to maintain optimum AOA. If you're still fast with the ball centered, reduce power and readjust nose attitude as necessary to maintain a centered ball and decelerate to optimum AOA. Approaching optimum AOA, add power to maintain proper glides-lope.

CAUTION: Never accept a low ball. If you're low, add power immediately. Do not reduce power until the ball is centered.

LINE-UP CORRECTIONS

Roll into the groove on the extended centerline of the carrier box. Line-up is critical at the carrier: The relatively small size of the landing area makes it imperative that you land on the centerline with no drift.
If you're not lined up at the start, make an immediate line-up correction. Failure to make line-up corrections in a timely manner will cause scan breakdown both in glideslope and AOA deviations. Be aware that line-up corrections require a corresponding power adjustment.
Being aware of local area winds will help you correct for line-up when rolling out in the groove. With consistent crosswinds, use the crab technique to maintain line-up.
Don't forget that every line-up correction requires a counter-correction as you approach the centerline. Chasing line-up will cause glideslope errors to follow.

COMMON ERROR: Fixating on the ball and not scanning lineup all the way to touchdown.

GROOVE
As you roll wings level, reduce power slightly to maintain on-speed and a proper rate of descent and call the ball. If you do not see the ball, call "Clara." Do not descend below 300 ft. Do not fixate on the ball but continue to scan your lineup and AOA. Glideslope becomes progressively narrower as you get closer to touchdown, you must decrease the magnitude of each correction for an equivalent amount of ball movement as you approach touchdown. The wings level transition is the most dynamic phase of each pass.
The excess energy required in the turn to maintain proper AOA must be bled off while maintaining optimum AOA and rate of descent.

LINE-UP
Roll into the groove using the extended centerline of the angled deck as your reference. Roll out with the centerline between your legs and keep it there all the way to touchdown. If it becomes necessary for the ship to create its own wind, line-up will be more difficult as the ship's centerline will be moving constantly to the right.
Scan the line-up all the way to touchdown, using small wing dips to make corrections. Line-up is critical at the ship—many accidents during carrier operations are lineup related

BALL CALL
As you roll into the groove with a ball, communicate the following: side number, type aircraft, you see the meatball, fuel state, and qual number.

NOTE: If you do not have the meatball in sight after rolling into the groove, immediately call "Clara." The LSO will respond with calls, such as, "You're high" or "You're low." Follow the LSO's calls. Once you have sight of the ball, call "ball."

CAUTION: Never descend below 300 ft AGL without a ball.

CARRIER APPROACH NOTES

*

Because of high winds at the ship, power corrections for a low ball will require a larger addition.

*

Corrections for a high ball will require smaller power reductions.

*

It is hard to correct for line-up at the ship due to the short length of the deck and the constant movement of the centerline.

*

Due to wind over the deck, you will feel high and tight when flying through the 90; resist the tendency to ease your turn and increase your rate of descent, thus causing low, overshooting starts.

*

At the ship, spotting the deck in close will result in a settle at the ramp and a possible No. 1 wire. This is a scan breakdown.

*

You will experience a tendency at the ship to fixate on a single item, such as the meatball, airspeed, or the wires. Don't fixate, Keep your scan moving.

*

Although the landing area is angled approximately 10 degrees, the pattern is flown parallel to the BRC (base recovery course).

WAVE-OFF

DO NOT initiate your own wave-off except in an emergency or if you have not received a "Roger ball" by in- the-middle. DO NOT take your own wave-off in close. The wave-off will normally be taken straight ahead or as directed by the LSO. When the wave-off signal is received, immediately apply military/afterburner power and effect a slight nose rotation to stop the rate of descent.

After a wave-off, bolter, or touch and go, begin the turn to downwind after climbing to a minimum of 300 ft AGL and when your interval is at your 10 o'clock position. During your climb and turn downwind, maintain 200 KIAS or on-speed AOA, whichever is greater, and a 30-degree AOB while climbing to pattern altitude.

NIGHT CARRIER OPERATIONS

Night carrier operations have a much slower tempo than daylight operations and it is the pilot's responsibility to maintain this tempo. Standard daytime hand signals from deck crew to pilot are executed with light wands.

U.S. Navy photo by Mass Communication Specialist 3rd Class Jon Hyde

Night CLP serves two important purposes. Ball control demands intensified concentration (because no other adequate visual references exist). It also demonstrates the need for smooth, precise instrument flying in the pattern.

U.S Navy photo by Mass Communication Specialist 3rd Class Brandon C. Wilson

Arrestment and Exit From the Landing Area

During the approach all exterior lights should be on with the exception of taxi/landing light. Following arrestment, immediately turn the external lights master switch off. Taxi clear of the landing area following the plane director's signals.

Chapter 6: DELTA PROCEDURES

If the deck or runway becomes fouled, you will be directed to go into a holding (Delta) pattern. You will be cleared out of the Delta Pattern by a "Charlie" call.

Delta Easy
Turn at 10:00 In the Delta Easy pattern, remain in a dirty configuration, speed brakes in at 130 KIAS, and at pattern altitude or as directed by the LSO.
Fly a normal racetrack pattern offset to the left-hand side of the runway while maintaining proper interval on the aircraft ahead.
When aircraft in the Delta Easy pattern are cleared, the first aircraft to reach the 180 will resume the landing pattern.

Delta Clean
If instructed to Delta Clean when already established in the FCLP pattern, clean up, accelerate to 200 KIAS, and climb to 2,000 ft MSL or the altitude directed.
If you are told to Delta upon arrival at the field, enter the initial in accordance with course rules or as directed by the LSO/tower, maintain 200 KIAS, and proceed overhead the duty runway taking interval with the aircraft already in the Delta pattern. Fly a normal racetrack pattern while maintaining proper 10 o'clock interval.
All aircraft should remain within 3 nm of the field. When cleared out of Delta, the first aircraft abeam will depart the Delta pattern to arrive at the initial with wings level, at 250 KIAS, and at initial altitude for the break. All aircraft will follow in order.

Radio Difficulties In The Pattern
If your receiver operates but your transmitter does not, the LSO may elect to work your aircraft in the pattern. If a receiver failure occurs while you're in the pattern, rock your wings and expect to perform a full-stop landing on the next pass.
Momentary (2 seconds) cut lights on the ball the first time signal "Roger ball."
Subsequent momentary illumination of cut lights means "add power." Alternating cut and waveoff lights signal you to proceed to your prebriefed divert field.
*
In all cases, remember: "Aviate, navigate, communicate."

Chapter 7: NAVAL AVIATOR STORIES

By Ring_Wraith, Naval Aviator of an S-3 Viking

In some ways aircraft carrier landings are a zen experience. For the fifteen to twenty seconds you are on final approach, there are only three things in the entire universe you care about: Meatball, lineup, and angle-of-attack. Everything else fades into irrelevance. It's a very simple existence.
But we'll come back to that. I should probably explain how you get yourself set up in such a situation.
First, you'll have to join the Navy*. And you can't just enlist, either - you have to be a commissioned officer...
Okay, I'll skip forward a bit.

Carrier qualification comes quite far into your training as a Naval Aviator. You'll have had an extensive ground school, on the order of about 150 hours of dual instruction, a couple of dozen hours solo. You'll have gone through an intense syllabus in instrument flying, aerobatics, and formation flying. You'll have completed a dozen or so flights devoted to fclp ("field carrier landing practice") during each of which you will have done a dozen or so practice approaches to a carrier deck sized box painted on the runway, with every landing graded by the landing signal officer, or LSO. You have to convince the LSO that you won't kill yourself or scare anyone unduly before they let you fly out to the ship for real.

The daytime traffic pattern at the carrier is an ovoid "race track" with the downwind leg at 600 feet, 180 degrees opposite to the "Base Recovery Course" on which the ship is steaming. (Procedures at night are totally different, and I'm blowing them off for this w/u.) Civil aircraft and the Air Force practice a box-shaped traffic pattern, with crosswind, downwind, base, and final approach legs.

The Navy, though, has found that timing, spacing, and interval are more easily controlled with the race-track pattern, where the planes make a constant, semi-circular turn from the downwind leg to the final approach.
You enter this traffic pattern by flying at 800 feet right up the wake of the ship, passing close-aboard to starboard. You'll be at about 250 knots, or faster if you're a show-off, and, unless the plan is for "touch-and-go" landings, your tailhook will be down. You must spot any other traffic in the pattern, and extend upwind appropriately to allow the proper time interval. You must allow any plane ahead of you from 30 to 45 seconds, to give them time to taxi clear of the landing area and reset the arrester gear.
Now comes the fun part. It's called a "break" turn. It's a full aileron-deflection leftward snap roll over to a 70 to 90 degree angle of bank, accompanied by a chop of the throttle to idle, and extension of full speed-brakes. This should be a very crisp, head-snapping maneuver.

You are being watched, after all, by irritable old men in pay grades far above yours. As you bank over, you pull back the stick to about a 3 to 4 'g' pull. You must be careful to keep this high-g turn level. You will swiftly decelerate to the airspeed at which you can extend the landing gear and flaps. And you must be very careful to roll out of this turn on the proper reciprocal, downwind heading.

As you slow down and approach the proper heading for the downwind leg, you can descend out of 800 feet for 600. After gear and flap extension you decelerate even more rapidly. You must come back up on the throttle to halt this deceleration at the proper speed for the approach (on which more in a moment.) You will be constantly trimming the aircraft as appropriate for the landing configuration. Once established on the downwind leg, you will complete your landing checklist. It should be apparent that you have an awful lot to do in a very few seconds.

Now, the "Navy way" here is to decelerate to and maintain the optimum airspeed for final approach. The complication is that this airspeed varies rather widely with things like remaining fuel load, unexpended ordnance, and so forth. So you don't use your airspeed indicator. You use an "angle-of-attack," or AOA indicator, which measures the angle at which the airfoil of the wing meets the oncoming airstream. It's a little bit of aerodynamics for business majors, but there is an optimum AOA you can fly that will put you at the optimum approach airspeed, no matter what your aircraft's gross weight. The indicator you use for this is a small array of colored lights atop your instrument panel, arranged thusly:

v
o
^

If the center 'o', colored yellow, is lit, you're 'on speed', or at the proper AOA. If the upper chevron, colored green, is lit, you are slow, and must pitch the airplane nose-down a bit to speed up. If the lower chevron, colored red, is lit, you are fast and must pitch nose-up a bit.

And here we get into what was, for me at least, a little counter-intuitive. Because you control your airspeed with your pitch attitude, and you control your rate of descent with the throttle. It seems a little backwards, doesn't it?

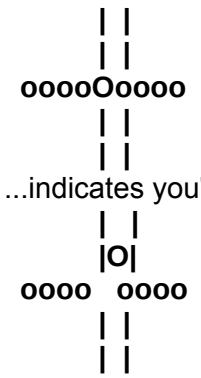
If you've done everything right, you'll pass down the ship's port side at about 1 to 1.25 miles. You begin your turn to final approach when "abeam" the stern of the ship (this position is called the "one-eighty" because you have that many degrees to turn...except that's not exactly true, as I'll describe in a moment...)

You should be "on speed" and trimmed up for hands-off flight. You pull back the throttle just enough, while maintaining your AOA by minute pitch angle changes so that the aircraft attains about a 250 foot per minute rate of descent. You establish maybe a 15 degree angle-of-bank turn.

I always used to take one last quick glance at the landing-gear indicators to make sure all three were down and locked.

And then you basically "hold what you got" until the "90", which is 90 degrees of turn off the downwind heading. You should be passing through 450 feet altitude, still on speed. Your rate of descent, again controlled by the throttle, can increase to 400-450 feet per minute. The plane ahead of you in the traffic pattern should be touching down. Don't look at him, you've gotta pay attention.

At the "forty-five" (I bet you can guess where this is in the pattern) you should start to pick up the "meatball," AKA the optical carrier landing aid. This is basically a Fresnel lens, described in another write up, but the upshot is that there's a light array, about 6 feet high, just to the left of the landing area on the flight deck. It has a horizontal row of green lights, called the "datum lights", and an orange light, or "meatball," that rides up and down to indicate your situation relative to the optimum glideslope, for example:



...indicates you're on the 3-degree glide slope, and...

...indicates you're above it.

...Also, the lowest cell on the display is red, to indicate that you're about to be in trouble. The Landing Signal Officer, or LSO, will invariably give you a "wave-off" if you're too low. He does this by triggering a button on a hand-grip he holds, (called the "pickle".) This makes the the meatball array flash , and is your signal to add full throttle, abort the descent, climb back up to the traffic pattern, and go around for another try.

As I say, you'll begin to pick this display up at around the "forty-five" position. You'll announce that you see it with a very concise radio announcement, as follows:

"...Gambler 703, Viking ball, 8.6"

Which translates to: This is Gambler 703 (Gambler would be my squadron callsign, 703 would be the number painted on the tail), I DO see the ball, and I'm an S-3 Viking, and I've got 8600 pounds of fuel remaining.

The LSO will reply: "Roger ball."

You'll continue turning and descending. If you're high you'll increase descent by pulling back on the throttle while maintaining optimum AOA. If you're low you'll decrease rate of descent by advancing the throttle, again maintaining optimum AOA. When the meatball is properly centered, you'll make appropriate throttle adjustments to re-establish the proper rate of descent to stay on the glideslope. Minute stick and throttle adjustments are constant from this point forward. They must be subconsciously automatic, which is one reason why you did so many practice approaches back at the field.

And at this point you've also reached your final approach heading, and should roll out of your bank. You should be established on the extended center line that runs down the landing area on the flight deck.

Which, as I hinted earlier, is NOT aligned with the course the ship is steaming! Modern carriers have angled flight decks...the landing area is canted 10 degrees to PORT of the ship's keel (and the course it steams on).

This is so that, if you miss a wire, you can simply roll off the end of the angled landing area, safely clearing the planes parked on the ship's bow, and go around again for another try.

This means that, as you approach the final leg, you'll cross the ships wake at a shallow angle, and continue your turn for another 10 degrees to align with the landing area. It also means that, as you come down on final, the ship is constantly moving from your left to your right. So you have to make tiny, subtle corrections to stay on the proper line-up. Aren't you glad you signed up for this duty?

So now you're on final approach, about 15 to 20 seconds out. An ideal carrier landing will be a ride down a 3-degree glide slope all the way to touch down...the pilot will see a centered meatball with no deviations, and airspeed will stay "pegged" at the optimum AOA. To maintain this you'll have to make constant, rapid, tiny corrections. You do NOT look at the landing area - this is called "spotting the deck," and is a no-no.

The plane ahead of you will either taxi clear of the landing area in time, or not. If he doesn't, the LSO will give you a wave-off, and you'll go round for another try. Your attention constantly bounces from the meatball, to your line-up, to your AOA gauge. Ahh, this is sublime.

There is no "flare" at the end of the approach like you see airliners, light planes, and air-force pilots do. You fly the glide-slope until the deck gets in the way. So you hit the deck with a good solid thump. And, since you're watching the meatball, not the deck, the exact moment of every landing is a surprise. The ship has four arrestor wires, and, if you do it right, you'll put the point of your tailhook down in the middle of them, i.e., between wires 2 and 3. The ideal landing is therefore a "3-wire".
At the moment of touchdown, you do another thing that's a bit counter-intuitive when you first learn of it: You JAM FULL THROTTLE!
This is because your hook can MISS the arrestor wires. In fact, you can make a PERFECT approach, and your hook can occasionally bounce over the wires.
This is called a bolter, and it's no big deal provided you can climb away as you roll off the end of the landing area. Jet engines can take a few seconds to "spool-up" to full power, though (they've gotten a lot better in recent years; the early ones were really dangerous). So you want to apply full-throttle on touchdown in anticipation.

The arrestor wires will still stop you just fine, even at full throttle. Only once you're sure you're aboard do you pull throttle back to idle, and look for the "yellow-shirt" for taxi direction to your parking spot.
It is, as they say, an "E" ticket ride. You go from around 140-150 mph (a bit slower, maybe 130 in S-3's) to a dead stop in a bit over a second. When you CQ, or carrier qualify, you typically have to do 5 or 6 of these in succession...which means you trap, then launch from the catapult, go back around immediately and do it again. Back in the day I was, as they say, a whisper-thin lad, and I'd always have bruised collarbones from the shoulder-straps at the end of the day.

Every approach is graded; the LSO de-briefs you on any excursions you made from an optimum approach (they have their own shorthand notation they use to denote and record this). They're very hard to please; the best grade you can possibly get on an approach is called "OK". There is provision in the system for an "OK UNDERLINED", which would denote either a particularly flawless approach, or a heroic feat of airmanship while damaged, on fire, etc, for which you can expect to be awarded an air medal. The typical, competent approach will get you a "Fair." Or, if you're failing, you'll get a "no-grade." Get too many of those and you're looking for other work.

They post the grades for every pilot, no matter the rank, on a "greenie board" in your squadron's ready room. Junior officers can and do out-score senior ones, which leads to awkward situations. But the system has an integrity that you have to respect, because if you screw up too badly, you die.
And sometimes, you can do everything PERFECTLY and STILL die.

Carrier Landing by Shadow

Flash back to the early 70's. the war was winding down. and low and behold. some genius decided that the RF-8's were tired and worn out and they needed to be replaced by a newer aircraft. Trouble was, the only thing around was the RF-4B. and they belonged to us. the Marines.

Since most of us "Green Machine" types hadn't seen the blunt end of the boat since the training command. initial efforts were a real horror show. I was determined that when my time came. I'd rather die than look bad at the boat. Day CQ (carrier quals, i.e. carrier landings) didn't bother any of us. been there, done that.

Night CQ however, was a different story. Not one pilot in our squadron had ever had a night trap. When my turn came. it was aboard the USS Kitty Hawk. I'd gotten in my required day landings and had flown out to the ship earlier in the day to check on my troops (I was the Maint. Officer). Also on board was newly designated CAG (carrier air group commander) James Flatley. He was going through a refresher course in the F-4 at Miramar.

After attending to my troops, I made my way down to the ready room and found out that I was scheduled for the first night launch with CAG. Since we were both on the boat already . I couldn't believe my good fortune, my first night traps were going to be " easy pinkies ". it was forecast to be a " field grade" night. About that time, CAG came into the ready room and introduced himself. seemed like a nice enough guy. said we'd brief about 1630 for an 1800 launch.

After he left the room, one of the Navy guys asked me if I knew who the CAG was? I shrugged my shoulders and he proceeded to tell me about Flatleys's C-130 caper [no-hook cargo aircraft full-stop carrier landing experiments]. Now I was impressed ! Around 1530, the ship sailed into a fog bank. By the time we briefed. the weather was "Zero-Zero". Damn the luck ! We briefed anyway and hung out in the ready room for hours, waiting for a break. No luck. Around 2200 we decided to bag it. We secured to our respective rooms. but my back seater and I were ' wired' and found it hard to sleep ... cursing what had started out to be a good deal that had gone south with the weather. I think I finally nodded off at about 2330. only to be rudely awakened by some sailor around 0100." Sir, CAG is waiting for you in the ready room. You're going flying ! "

In a literal fog. we jumped into our bags and made our way down to the RR. There stood CAG. bright eyed and bushy tailed. fresh as a flower. as I recall, he even smelled of after shave. " Hey, let's do it ", he said. "The brief is the same as earlier, except for bingo which is 4.9. So every trap will be a trick or treat. I'll go first and give you a PIREP down-wind. see you up top". With that he wheeled out of the ready room and headed up topside.

My brain was trying to absorb his abbreviated lecture as I was putting on my speed slacks and torso harness. when it dawned on me. Max trap fuel weight for the F-4 was 5.1! With a bingo of 4.9, we only had two hundred pounds to play with! Hence his cavalier " Trick or Treat " statement meant, we either got aboard or went home immediately.

With such a high bingo fuel state. we were way the hell out to sea and land at [home base] Miramar was IFR. At least I thought, we'll have a thousand and three here at the boat [required for initial night CQ] . as my bleary eyes scanned the chalk board where I saw, " Estimated 300 overcast, ¾ mile". " S___, I thought! That can't be right " ? We made our way up to the flight deck and as I came out of the island. I'm immediately slapped in the face with moisture. I can't believe we're going to fly in this crap! I look over and CAG is climbing up the cockpit ladder. in the [artificial] twilight like mist, I can barely make out him turning toward me, smiling and giving me a thumbs up !

In my heart, I'm wanting to believe this is just a cruel joke they're playing on this young Marine. that at some point they'll say : secure flight operations. just kiddin' ! I'd surely rather have been the butt of the joke. than to have to do this. at this time. for real ! As I started engines. reality hit home. it was for real. and like it or not. we were going to do it. CAG and I taxi up to the CAT. the boss comes up and says they'll work the pattern single frequency until turned over to CCA. CAG needed only two traps to re-qualify . while I needed to get a full bag. six.

As I cross the shuttle, CAG is in tension and is quickly fired off the bow, disappearing immediately ! As I go through the cockpit checks, I try to keep my voice as low as possible (trying not to do a Tiny Tim impersonation) and keep my heart from pounding a hole in my chest. Truthfully, Marine or not. I was scared s_____ !

God never made a blacker void than off the bow of the boat at night with no stars and no moon. Only those of us who've been there. can truly appreciate what I'm saying, here. By this stage of my life, I'd been shot at. missed and hit. but never had anything make me as tense. The bad dream was about to get worse as we fired off into the void. Just as I'm turning downwind, CAG goes over to CCA. as I turn to final. the CCA final controller comes up, fires off a staccato of instructions and ends with a terse. " CAG says it's workable".

Down the chute we came. Folks. I'm working harder than I've ever had to in the cockpit. This was not the joy of flight ! It was just short of stark raving terror ! CCA then says. you're now ¾ mile . call the ball ! I glance up and nothing ! Okie, my backseater says. " 200 feet". Paddles says, "Call the ball ! " Another glance and still nothing ! I keyed the mike and said, " I can't see s___" ! As the expletive was leaving my lips. It was suddenly there . and I had about a nano-second before we hit the deck and caught a wire. Unlike a day trap where one feels euphoria and exhilaration. my first night trap left me with the impression that I'd just cheated death. Big Time !

Coming out of the wire and I taxied over to the purple shirts. my knees were shaking like a leaf and my boots were drum beating on the rudder pedals. Once I was chained down and taking on fuel. paddles comes up and says, "Shadow, go squadron common". I switch frequencies. "What'd ya think"? I said. " I didn't break out until 100 to 150 feet. This is insane!" He replies, " I knew you'd say that. that's why I switched you over to this freq." I asked what happened to our 1,000 and three minimums. He then threw down the gauntlet. " If an old man [like me] can do it, you can too " ! Why'd he have to say that ? The bastard knew I'd take the bait ! It would end up being the longest night I ever spent in a fighter cockpit.

CAG got his second and blew me a kiss as I taxied up to the cat for my third. Just before my third trap [another 100 footer]. the boss tells me that the air wing is coming out from Miramar. and the pattern will get more crowded soon. After the third trap. I'm steeling myself for the last go [I thought] while taking on fuel. when all of a sudden the horror show began. Plane after plane is waved off, or bolters. I'd gotten all the way up to the cat when I had to push back and take on more fuel. one of my squadron mates initiated a wave-off FROM BELOW FLIGHT DECK LEVEL... IN FULL AFTER BURNER ! Then a Viggie hits the round down and wipes out the number one wire. at this point, I truly believe exhaustion over took fear. I fire off for number four and upon recovery. instead of taxiing me forward. I'm sent back to the ' grapes' once again. " What's going on ? ", I think. Paddles then comes up and says. " Looks like you're the only game in town. We're going to the Admiral for a waiver if you think you can hack it. It's up to you". Amazing how they absolve themselves of any responsibility. Tired and beaten, but ego still intact. I said, "F___ . Let's do it " ! No sooner were the words out of my mouth than from the back cockpit. Larry tersely says : " Hey . don't I get a vote? "

As it turned out, approval was granted and I completed initial night qualification in one night. Six Cats, Six Traps. All the way back down to the ready room, my six foot conscience [my backseater] is nipping at my heels. and telling me how stupid we were to do it. As we get to the ready room. there stands CAG. He comes up, shakes my hand and says. " We did it, great job. what'ya think? "

White as a sheet. I responded with : "Honestly CAG, the last one was just as scary as the first one and it never got any better ! " He laughed and hit me with the old cliché. "If you ain't scared, you don't belong here". He then invited us up to his room for a toddy. Amazing how drunk you can get off one drink when you're ragged out. As we got up to go to our own room. I turned to CAG and thanked him for waiting up for us. but imbued with a little libation. I ended with. "CAG, I hope you never are the duty weather pilot again. 'CAUSE YOU'RE A LYING SUMBITCH !" He just looked at me, smiled and said : "Come on get outta here"..

To this day, whenever I cross paths with Jim Flatley. I point him out to who I'm with and say, "You see that man over there. He's a lying sumbitch !... Workable my ass" ! Every time I do this, he gives me that same twinkling smile. feigns ignorance. and says: "Get outta here". As long as I live, I'll never forget this living Navy legend and the night he conned me into going six for six.

Shadow

NATO Brevity Codes in alphabetical order

ABORT(ING)(ED)	Directive/informative to cease action/attack/event/mission.
ACTION	Directive to initiate a briefed attack sequence or maneuver.
ACTIVE	An emitter is radiating.
ADD	Directive call to add a specific (system) or (EOB category) to search responsibility.
ALARM	Directive/informative indicating the termination of EMCON procedures.
ALLIGATOR	Link-11/ TADIL A.
ALPHA CHECK	Request for/confirmation of bearing and range to described point.
ANCHOR(ED)	1. Orbit about a specific point; refueling track flown by tanker. 2. Informative to indicate a turning engagement about a specific location.
ANGELS	Height of friendly aircraft in thousands of feet.
ARIZONA	No ARM ordnance remaining.
AS FRAGGED	Unit or element will be performing exactly as stated by the air tasking order.
AUTHENTICATE	To request or provide a response for a coded challenge.
AUTOCAT	Any communications relay using automatic retransmissions.
AZIMUTH	Two or more groups primarily separated in bearing.
BANDIT	An aircraft identified as enemy, in accordance with theater ID criteria. The term does not necessarily imply direction or authority to engage.
BANZAI	Informative or directive to execute launch and decide tactics.
BASE (Number)	Reference number used to indicate such information as headings, altitude, fuels, etc.
BEAD WINDOW	Last transmission potentially disclosed unauthorized information.
BEAM(ING)	Target stabilized within 70 to 110 degree aspect; generally (Direction) given with cardinal directions: east, west, north, south.
BENT	System indicated is inoperative.
BINGO	1. Fuel state needed for recovery. 2. Proceed/am proceeding to specified base (field) or carrier.
BIRD	Friendly surface-to-air missile (SAM).
BIRD(S) AFFIRM	S/A informative indicating unit is able and prepared to engage a specified target with SAMs (presumes target is within or will enter the SAM engagement envelope).
BIRD(S) AWAY	Friendly SAM has been fired at designated target.
BIRD(S) NEGAT	S/A informative indicating unit is unable to engage a specified target with SAMs. Opposite of BIRD(S) AFFIRM.
BITTERSWEET	Notification of possible BLUE ON BLUE situation relative to a designated track or friendly aircraft.
BLANK	A SEAD aircraft does not detect any emitters of interest.
BLIND	No visual contact with friendly aircraft/ground position. Opposite of VISUAL.
BLOW THROUGH	Directive/informative call that indicates aircraft will continue straight ahead at the merge and not turn with target/targets.
BOGEY	A radar or visual air contact whose identity is unknown.
BOGEY DOPE	Request for target information as briefed/available.
BOX	Groups/contacts/formations in a square or offset square.

BRAA	Tactical control format providing target bearing, range, altitude, and aspect, relative to a friendly aircraft.
BRACKET	Indicates geometry where friendly aircraft will maneuver to a position on opposing sides, either laterally or vertically from the target.
BREAK (Direction)	Directive to perform an immediate maximum performance turn in the direction indicated. Assumes a defensive situation.
BREAKAWAY	Tanker or receiver directive call indicating immediate vertical and nose/tail separation between tanker and receiver is required.
BREVITY	Radio frequency is becoming saturated/degraded or jammed and briefer transmissions must follow.
BROADCAST	Request/directive to switch to broadcast control.
BROKE LOCK	Loss of radar/IR lock-on (advisory).
BRUISER	Friendly air launched anti-ship missile (ASM). (E.g., HARPOON, EXOCET, PENGUIN.)
BUDDY LOCK	Locked to a known friendly aircraft. Normally a response to a "SPIKED" OR "BUDDY SPIKE" call and accompanied with position/heading/altitude.
BUDDY SPIKE	Friendly aircraft air-to-air indication on RWR. To be followed by position/heading/altitude.
BUGOUT	Separation from that particular engagement/attack/operation; no intent to (Direction) re-engage/return.
BULLDOG	Friendly surface/submarine launched anti-ship missile (ASM). (E.g., HARPOON, EXOCET, OTOMAT.)
BULLSEYE	An established point from which the position of an object can be referenced. Made by cardinal/range or digital format.
BUMP/BUMP-UP	A fly-up to acquire LOS to the target or laser designation.
BURN	GLINT used to provide illumination.
BUSTER	Directive call to fly at max continuous speed (military power).
BUZZER	Electronic communications jamming.
CANDYGRAM	Informative call to aircraft that EW targeting information is available on a briefed secure net.
CAP/CAPPING (Location)	1. Directive call to establish an orbit at a specified location. 2. An orbit at a specified location.
CAPTURED	Aircrew has identified and is able to track a specified A/G target with an onboard sensor.
CEASE ENGAGEMENT	In air defense, break the engagement on the target specified. Missiles in-flight will continue to intercept.
CEASE FIRE	Do not open fire or discontinue firing; complete intercept if weapons are in-flight; continue to track.
CHAMPAGNE	An attack of three distinct groups with two in front and one behind.
CHATTERMARK	Begin using briefed radio procedures to counter communications jamming.
CHEAPSHOT	1. (USAF) Active missile supported to high PRF but not medium PRF. 2. (Naval) Active missile not supported to active range.
CHECK (LEFT/RIGHT)	Turn ( ) degrees left or right and maintain new heading.
CHERUBS	Height of a friendly aircraft in hundreds of feet.
CHICKS	Friendly aircraft.
CLEAN	1. No radar contacts on aircraft of interest.

	2. No visible battle damage. 3. Aircraft not carrying external stores.
CLEARED	Requested action is authorized (no engaged/support roles are assumed).
CLEARED HOT	Ordnance release is authorized.
CLOAK	Directive/informative switch from normal external lighting to covert NVD only compatible lighting.
CLOSING	Decreasing in range.
COLD	1. Attack geometry will result in a pass or roll out behind the target. 2. On a leg of the CAP pointed away from the anticipated threats. 3. Group(s) heading away from friendly aircraft.
COLOR (System/Position)	Request for information on a (system) at stated location; usually a request for ambiguity resolution. May be used with IDM data message - COLOR, DATA.
COMEOFF (Left/Right/ Low/Dry)	Directive to maneuver as indicated to either regain mutual support or to deconflict (Left/Right/ flight paths for an exchange of engaged and supporting roles. Implies both “visual” and “tally.”
COMMIT(TED)	Fighter intent to engage/intercept; controller continues to provide information.
CONFETTI	Chaff lane or corridor.
CONS/CONNING	Threat/bogey aircraft leaving contrails.
CONTACT	1. Sensor contact at the stated position. 2. Acknowledges sighting of a specified reference point.
CONTINUE	Continue present maneuver, does not imply clearance to engage or expend ordnance.
CONTINUE DRY	Ordnance release not authorized.
COVER(ING)*	Directive/informative to take S/A action or establish an A/A posture that will allow engagement of a specified target or threat.
CRANK (Direction)	F-Pole maneuver; implies illuminating target at radar gimbal limits.
CUTOFF	Request for, or directive to, intercept using cutoff geometry.
CYCLOPS	Any UAV.
DASH (#)	Aircraft position within a flight. Use if specific callsign is unknown.
DATA (Object/Position)	Standby for IDM data messageconcerning (object) at stated location.
DEADEYE	Informative call by an airborne laser designator indicating the laser/IR system is inoperative.
DECLARE	Inquiry as to the identification of a specified track(s), target(s), or correlated group.
DEFENSIVE (Spike/Missile/ SAM/Mud/AAA)	Aircraft is in a defensive position and maneuvering with reference to the stated condition.
DE-LOUSE	Directive to detect and identify unknown aircraft trailing friendly aircraft.
DEPLOY	Directive to maneuver to briefed positioning.
DIVERT	Proceed to alternate mission/base.
DOLLY	Link-4A/TADIL C.
DRAG(ING) (Direction)	1. (AF) Target stabilized at 0-60 degrees aspect. 2. (Naval) Target stabilized at 120-180 degrees aspect.
DROP(ING)	1. Directive/informative to stop monitoring a specified emitter/target and resume search responsibilities.

	2. Remove the emitter/target from tactical picture/track stores.
DUCK*	Tactical Air Launched Decoy (TALD).
ECHELON	Groups/contacts/formation with wingman displaced approximately 45 degrees behind leader's 3/9 line.
ECHO	Positive SEESAW/EWWS/ System M/Mode X reply.
ENGAGED	Maneuvering with the intent to kill. Implies visual/radar acquisition of target.
ESTIMATE	Provides estimate of the size, range, height, or other parameter of a specified contact; implies degradation.
EXTEND	Short term maneuver to gain energy, distance, or separation; normally with (Direction) the intent of reengaging.
EYEBALL( )	1. Fighter with primary visual identification responsibility. 2. EO/IR/NVD acquisition of an aircraft. Normally followed by ( ) number of aircraft observed.
FADED	Radar contact is lost. (Termination of track plotting is not warranted.)
FAST*	Target speed is estimated to be 600 knots ground speed/mach 1 or greater.
FATHER	TACAN station.
FEET WET/DRY	Flying over water/land.
FENCE (IN/OUT)	Set cockpit switches as appropriate prior to entering/exiting the combat area.
FLANK(ING)	1. (USAF) Target with a stable aspect of 120 to 150 degrees. 2. (Naval) Target with stable aspect of 30 to 60 degrees.
FLASH (system)	Temporarily turn on prebriefed IFF mode or system.
FLOAT	Directive/informative to expand the formation laterally within visual limits to maintain a radar contact or prepare for a defensive response.
FOX (number)	Simulated/actual launch of air-to-air weapons. ONE - semiactive radar-guided missile. TWO - infrared-guided missile. THREE - active radar-guided missile.
FOX MIKE	VHF/FM radio.
FRIENDLY	A positively identified friendly contact.
FURBALL	A turning fight involving multiple aircraft with known BANDITs and FRIENDLIES mixed.
GADGET	Radar or emitter equipment.
GATE	Directive/informative to fly as quickly as possible, using after-burner/max power.
GIMBAL (Direction)	Radar target is approaching azimuth or elevation limits.
GO ACTIVE	Go to briefed Have Quick net.
GOGGLE/ DEGOGGLE	Directive/informative to put on/take off NVDs.
GORILLA	Large force of indeterminate numbers and formation.
GO CLEAR	Use unencrypted voice communications.
GO SECURE	Use encrypted voice communications.
GRANDSLAM	All HOSTILE aircraft of a designated track (or against which a mission was tasked) are shot down.
GREEN (Direction)	Direction determined to be clearest of enemy air-to-air activity.
GREYHOUND	Friendly ground attack cruise missile (e.g., TLAM, CALCM).

GROUP	Radar targets within approximately 3 NM of each other.
GUNS	An air-to-air or air-to-surface gunshot.
HARD (Direction)	High-G, energy sustaining turn.
HEAD/ HEAD ON	1. (USAF) Target with an aspect of 160 to 180 degrees. 2. (Naval) Target with an aspect of 0 to 20 degrees.
HEADS UP	Alert of an activity of interest.
HEAVY*	A group or package known to contain three or more entities.
HIGH*	Between 25,000 and 40,000 ft MSL.
HIT(S)	1. (A/A) Momentary radar return(s) in search. (Indicates approximate altitude information from fighter.) 2. (A/G) Weapons impact within lethal distance.
HOLD DOWN	Directive to key transmitter for DF steer.
HOLDING HANDS	Aircraft in visual formation.
HOLD FIRE	An emergency fire control order used to stop firing on a designated target, to include destruction of any missiles in flight.
HOME PLATE	Home airfield or carrier.
HOOK (Left/Right)	Directive to perform an in-place 180 degree turn.
HOSTILE*	A contact identified as enemy upon which clearance to fire is authorized in accordance with theater rules of engagement.
HOT	1. Attack geometry will result in roll out in front of the target. 2. On a leg of the CAP pointing toward the anticipated threats. 3. Group heading towards friendly aircraft. Opposite of COLD. 4. Ordnance employment intended or completed.
HOTDOG	Informative/directive call that an aircraft is approaching or at a specified standoff distance from the sovereign airspace of a nation (as defined by national boundaries or territorial sea and airspace). (COLOR may indicate additional standoff distance.) Follow briefed procedures.
HOTEL FOX	HF radio.
HUSKY	(Naval) AIM-120 supported to HPRF active. Same as USAF CHEAPSHOT.
I.D.	1. Directive to identify the target. 2. ID accomplished, followed by type.
IN (Direction)	Informative indicating a turn to a hot aspect relative to a threat/target.
INDIA	Mode IV.
INTERROGATE	Interrogate the designated contact of the IFF mode indicated.
JACKAL	Surveillance network participating group (NPG) of Link 16/TADILJ.
JOKER*	Fuel state above BINGO at which separation/bugout/event termination should begin.
JUDY	Aircrew has radar/visual contact on the correct target, has taken control of the intercept and only requires situation awareness information. Controller will minimize radio transmissions.
KILL	1. Clearance to fire. 2. In training, a fighter call to indicate kill criteria have been fulfilled.
KNOCK IT OFF	Directive to cease air combat maneuvers/attacks/activities.
LADDER	Three or more groups/contacts in range.
LASER ON	Directive to start laser designation.
LEAD-TRAIL	Tactical formation of two contacts within a group separated in range or following one another.

LEAKER(S)	Airborne threat has passed through a defensive layer. Call should include amplifying information.
LINE ABREAST	Two contacts within a group side-by-side.
LIGHTS ON/OFF	Directive to turn on/off exterior lights.
LOCKED (BRAA/Direction)	Final radar lock-on; sort is not assumed.
LOST CONTACT	Radar contact lost. (DROP track is recommended.)
LOST LOCK	Loss of radar/IR lock-on (advisory).
LOW*	Target altitude below 10,000 ft AGL.
MAGNUM	Launch of friendly antiradiation missile.
MAPPING	Multifunction radar in an A/G mode.
MARKING	Friendly aircraft leaving contrails.
MARSHAL(ING)	Establish(ed) at a specific point.
MEDIUM*	Target altitude between 10,000 ft AGL and 25,000 ft MSL.
MERGE(D)	1. Information that friendlies and targets have arrived in the same visual arena. 2. Call indicating radar returns have come together.
MICKEY	Have Quick time-of-day (TOD) signal.
MIDNIGHT	Informative advising that C2 functions are no longer available. Opposite of SUNRISE.
MONITOR	Maintain radar awareness on or assume responsibility for specified group.
MOTHER	Parent ship.
MUD (Type/Direction)	Indicates RWR ground threat displayed followed by clock position and type.
MUSIC	Electronic radar jamming. (On AI radar, electronic deceptive jamming.)
NAILS	RWR indication of AI radar in search. Add clock position/azimuth, if known.
NAKED	No RWR indications.
NEW PICTURE	Used by controller or aircrew when tactical picture has changed. Supersedes all previous calls and reestablishes picture for all players.
NO FACTOR	Not a threat.
NO JOY	Aircrew does not have visual contact with the target/bandit/landmark. Opposite of TALLY.
NOTCH (Direction)	All-aspect missile defensive maneuver to place threat radar/missile on the beam.
OFF (Direction)	Informative call indicating attack is terminated and maneuvering to the indicated direction.
OFFSET	Informative call indicating maneuver in a specified direction with reference (Direction) to the target.
ON STATION	Informative unit/aircraft has reached assigned station.
OPENING	Increasing in range.
OUT (Direction)	Informative indicating a turn to a cold aspect relative to the threat. Opposite of IN.
OUTLAW	Informative call that a bogey has met point of origin criteria.
PACKAGE	Geographically isolated collection of groups/contacts/formations.
PADLOCKED	Informative call indicating aircrew cannot take eyes off an aircraft or surface position without risk of losing TALLY/VISUAL.

PAINT(S)	Interrogated group/radar contact that is responding with any of the specified IFF modes and correct codes established for the ID criteria.
PARROT	IFF transponder.
PICTURE	Provide tactical situation status pertinent to mission.
PIGEONS	Magnetic bearing and range to HOMEPLATE (or specified destination). (Location)
PINCE/PINCER	Threat maneuvering for a bracket attack.
PITBULL	1. Informative AIM-120 is at MPRF active range. 2. AIM-54 at active range.
PLAYMATE	Cooperating aircraft.
PLAYTIME	Amount of time aircraft can remain on station.
POGO	Switch to communication channel number preceding POGO. If unable to establish communications, switch to channel number following POGO. If no channel number follows POGO, return to this channel.
POP	1. Starting climb for air-to-surface attack. 2. Max performance climb out of low altitude structure.
POPEYE	Flying in clouds or area of reduced visibility.
POPUP	Informative call of a contact that has suddenly appeared inside of meld/CCR/briefed range.
POSIT	Request for position; response in terms of a geographic landmark, or off a common reference point.
POST ATTACK (Direction)	Directive transmission to indicate desired direction after completion of intercept/engagement.
POST HOLE	Rapid descending spiral.
PRESS	Directive to continue the attack; mutual support will be maintained. Supportive role will be assumed.
PRINT (TYPE)	Unambiguous NCTR reply.
PUMP	A briefed maneuver to low aspect to stop closure on the threat or geographical boundary with the intent to reengage.
PURE	Informative indicating pure pursuit is being used or directive to go pure pursuit.
PUSH (Channel)	Go to designated frequency. No acknowledgment required
PUSHING	Departing designated point.
PUSHING (Group description)	Informative that said group(s) have turned cold and will continue to be monitored.
RANGE*	Two or more groups separated primarily in distance along the same bearing.
RAYGUN (Position/Heading/ Altitude)	Indicates a radar lock-on to unknown aircraft. A request for “Buddy SPIKE” reply from friendly aircraft meeting these parameters (to prevent fratricide).
REFERENCE (Direction)	Directive to assume stated heading.
REPORTED (Type)	Identification of an object or a contact by an intelligence system.
RESET	Proceed to a prebriefed position or area of operation.
RESUME	Resume last formation/station/mission ordered.
RETROGRADE	Directive to withdraw from present position or area of operation in response to a threat.

RIDER	A bogey that is conforming with safe passage routing/airspeed/altitude procedures.
RIFLE	AGM-65 MAVERICK launch.
RIPPLE	Two or more munitions released or fired in close succession.
ROLEX (+/- Time)	Timeline adjustment in minutes from planned mission execution time. (Plus means later; minus means earlier.)
ROPE	Illumination of an aircraft with an IR pointer.
SADDLED	Informative from wingman/element indicating the return to briefed formation position.
SAM (Direction)	Visual acquisition of a SAM or SAM launch, should include position.
SANDWICHED	A situation where an aircraft/element positioned between opposing aircraft/elements.
SAUNTER	Fly at best endurance.
SCRAM (Direction)	Emergency directive to egress for defensive or survival reasons.
SCRAMBLE	Takeoff as quickly as possible.
SCUD	Any threat TBM.
SEPARATE	Leave a specific engagement; may or may not reenter.
SHACKLE	One WEAVE, a single crossing of flight paths; maneuver to adjust/regain formation parameters.
SHADOW	Follow indicated target.
SHIFT	Directive to shift laser illumination.
SHOOTER	Aircraft/unit designated to employ ordnance.
SHOTGUN	Prebriefed weapons state at which separation/bugout should begin.
SKATE	Informative/directive to execute launch and leave tactics.
SKIP IT	Veto of fighter commit, usually followed with further directions.
SKOSH	Aircraft is out of/or unable to employ active radar missiles.
SKUNK	A radar or visual maritime surface contact whose identity is unknown.
SLAPSHOT (Type/Bearing)	Directive for an aircraft to employ a range unknown HARM against a specified threat at the specified bearing.
SLIDE	Directive call to HVAA to continue present mission while extending range from target in response to perceived threat.
SLOW*	Target with a ground speed of 300 knots or less.
SMASH	Directive to turn on/off anticollision lights.
SMOKE	Smoke marker used to mark a position.
SNAKE	Directive to oscillate an IR pointer about a target.
SNAP (Direction)	An immediate vector to the group described.
SNIPER	Directive for an aircraft to employ a range-known HARM against a specified threat at the specified location.
SNOOZE	Directive/informative indicating initiation of EMCON procedures.
SORT	Directive to assign responsibility within a group; criteria can be met visually, electronically (radar) or both.
SORTED	Sort responsibility has been met.
SOUR	1. Equipment indicated is operating inefficiently. 2. Invalid response to an administrative IFF check. (Opposite of SWEET)
SPADES	An interrogated group/radar contact which lacks the ATO (or equivalent) IFF modes and codes required for the ID criteria.

SPARKLE	Target marking by IR pointer. Target marking by gunship or FAC-A using incendiary rounds.
SPIKE RWR	indication of an AI threat in track, launch, or unknown mode. Include bearing/clock position and threat type, if known.
SPIN	Directive/informative to execute a prebriefed timing/spacing maneuver.
SPITTER (Direction)	An aircraft that has departed from the engagement or is departing the engaged fighters targeting responsibility.
SPLASH	1. (A/A) Target destroyed. 2. (A/G) Weapons impact.
SPLIT	An informative call that a flight member is leaving formation to engage a threat; visual may not be maintained.
SPOOFING	Informative that voice deception is being employed.
SPOT*	Acquisition of laser designation.
SQUAWK ( )	Operate IFF as indicated or IFF is operating as indicated.
SQUAWKING (Mode #)	An informative call denoting a bogey is responding with an IFF mode.
STACK	Two or more groups/contacts/formations with a high/low altitude separation in relation to each other.
STATUS	Request for tactical situation.
STEADY	Directive to stop oscillation of IR pointer.
STEER	Set magnetic heading indicated.
STERN	Request for, or directive to, intercept using stern geometry.
STINGER	Within a group, a formation of three or more aircraft with a single aircraft in trail.
STOP	Stop IR illumination of a target.
STRANGER	Unidentified traffic that is not associated with the action in progress.
STRANGLE ( )	Turn off equipment indicated.
STRIP	Individual fighter/section is leaving the formation to pursue separate attacks.
STRIPPED	Informative call from wingman/element indicating out of briefed formation/position.
STROBE	Radar indications of noise jamming.
SUNSHINE	Directive or informative indicating illumination of target is being conducted with artificial illumination.
SUNRISE	Informative C2 functions are available (opposite of MIDNIGHT).
SWEET	1. Equipment indicated is operating efficiently. 2. Valid response to an administrative IFF check. (Opposite of SOUR.)
SWITCH(ED)	Indicates an attacker is changing from one aircraft to another.
TACTICAL	Request/directive to switch to tactical control.
TAG	(System, Known identification of a specific (system) at the stated location.
W/Position)	May be used with IDM data message (e.g., “TAG DATA”).
TALLY	Sighting of a target, bandit, bogey, or enemy position; opposite of NO JOY.
TARGET ( )	Directive to assign group responsibility to aircraft in a flight.
TARGETED ( )	Group responsibility has been met.
TEN SECONDS	Directive to terminal controller to standby for LASER ON call in approximately 10 seconds.

TERMINATE	1. Stop laser illumination of a target. 2. Cease local engagement without affecting the overall exercise.
THREAT (Direction)	Untargeted HOSTILE/BANDIT/BOGEY within prebriefed range/aspect of a friendly.
THROTTLES	Reduction in power to decrease IR signature.
TIED	Positive radar contact with element/aircraft.
TIGER	Enough fuel and ordnance to accept a commit.
TIMBER	Air control NPG of Link 16/ TADIL J.
TRACKING	1. Stabilized gun solution. 2. Continuous illumination of a target. 3. Contact heading.
TRAILER*	The last aircraft within a group(s).
TRASHED	Informative call that missile has been defeated.
TRESPASS	The addressed flight is entering a S/A threat ring of a specific system at the (Position) stated location.
TUMBLEWEED	Indicates limited situational awareness; NO JOY; BLIND; a request for information.
UNABLE	Cannot comply as requested/directed.
UNIFORM	UHF radio.
VAMPIRE	Hostile Anti-Ship missile (ASM).
VERY HIGH*	Above 40,000 ft MSL.
VIC	Three groups, contacts, or formations with the single closest in range and two contacts, azimuth split, in trail.
VICTOR	VHF/AM radio.
VISUAL	Sighting of a friendly aircraft/ground position; opposite of BLIND.
WALL	Three or more groups or contacts primarily split in azimuth.
WARNING (color)	Hostile attack is— RED imminent or in progress. YELLOW probable WHITE improbable (all clear).
WEAPONS ( )	Fire only - FREE at targets not identified as friendly in accordance with current ROE. - TIGHT at targets positively identified as hostile in accordance with current ROE. - HOLD (USA, USMC) in self-defense or in response to a formal order. - SAFE (USN)
NOTE: USN/NATO use “WEAPONS SAFE” to avoid confusion with the phrase “HOLD FIRE.”	
WEEDS	Indicates that aircraft are operating close to the surface.
WHAT LUCK	Request for results of missions or tasks.
WHAT STATE	Report amount of fuel and missiles remaining. Ammunition and oxygen are reported only when specifically requested or critical. ( ) Active = number of active radar missiles remaining. ( ) Radar = number of semiactive radar missiles remaining. ( ) Heat = number of IR missiles remaining. ( ) Fuel = pounds of fuel or time remaining.
WINCHESTER	No ordnance remaining.
WORDS	Directive or interrogative regarding further information or directives pertinent to mission.

WORKING	1. A SEAD aircraft is gathering EOB on a designated emitter. Generally followed by signal type, (SAM/AAA/ group) bearing, and range, if able. 2. Aircraft executing EID on a specific aircraft/group to obtain identification necessary for BVR employment.
YARDSTICK	Directive to use A/A TACAN for ranging.

Abbreviation terms

A

A/A	Air to air
A/C	Aircraft
AC	Alternating current
ACCUM	Accumulator
ACPT	Accept
ADB	Aircraft discrepancy book
ADC	Air data computer
ADF	Automatic direction finding
ADIZ	Air defense identification zone
ADS	Air data sensors
ADV	Advisory
AFCS	Automatic flight control system
A/G	Air to ground
AGL	Above ground level
AHRS	Attitude heading reference system
AI	Air Interrogator
AIL	Aileron
AIM	Air intercept missile
AINS	Aided inertial navigation system
ALE-47	Countermeasure dispensing set
ALM	Almanac
ALR-67	Radar warning receiver
AMAD	Airframe mounted accessory drive
AN/ALE-39	Countermeasures dispensing set
AN/APN-194	Radar altimeter set
AN/ARN-514	VOR/ILS System
AN/ASN-139	Inertial navigation system
AOA	Angle of attack
AOB	Angle of bank
A/P	Autopilot
APPR	Approach
APU	Auxiliary power unit
AQ	Align quality
ASL	Azimuth steering line
AT SCV	Air turbine starter control valve
ATARS	Advanced tactical air reconnaissance system
ATC	Air traffic control
ATC	Automatic throttle control
ATS	Air turbine starter
ATTH	Attitude hold
AUG	Augment
AUR	Aural
AUTO	Automatic
AVMUX	Avionics multiplex

B

BAC1	Bank angle control 1
BADSA	Backup air data sensor assembly
BALT	Barometric altimeter
BARO	Barometric
BCN	Beacon
BINGO	Minimum fuel required to return to base
BIT	Built in test
BLD	Bleed
BLIM	Bank limit
BLIN	Bit logic inspection
BNK	Bank
BRC	Base Recovery Course
BRG	Bearing
BRK	Brake
BRT	Bright

C

C	Celsius
CAS	Control augmentation system
CAUT	Caution
CB	Circuit breaker
CD	Countdown
CD ROM	Compact disk read only memory
CDP	Compressor discharge pressure
CG	Center of gravity
CHAN	Channel
CHKLST	Checklist
CIT	Combined interrogator / transponder
CK	Check
CKPT	Cockpit
CLR	Clear
CMDS	Countermeasures dispensing set
CMPTR	Computer
CNI	Communication, radio navigation, and identification
COMM	Communication radio
CONT PVU	Continuous precision velocity update
CPL	Coupled
CPLD	Coupled
CPU	Central processor unit
CRS	Course
CSC	Communication system control
CSEL	Selected course
CSFIRS	Crash survivable flight incident recorder system
CSS	Control stick steering
CTR	Center
CV	Carrier
CVRS	Cockpit Video Recording System

D

DBS	Doppler beam sharpened
DC	Designator controller
DC	Direct current
DDI	Digital display indicator
DEGD	Degraded
DEL	Direct electrical link
□P	Hydraulic filter indicator
DISCH	Discharge
DFIRS	Deployable flight incident recorder system
D/L	Data link
DMA	Defense mapping agency
DME	Distance measuring equipment
DMS	Digital map set
DN	Down
DSU	Data storage unit
DTE	Data transfer equipment

E

E BATT	Emergency battery
EADI	Electronic attitude display indicator
ECA	Electrical control assembly
ECS	Environmental control system
EGI	Embedded INS/GPS
EGT	Exhaust gas temperature
EHPE	Estimated horizontal position error
ELEV	Elevation
EMCON	Emission control
EMD	Engine monitor display
ENG	Engine
ENRT	Enroute
ENT	Enter
EPE	Enhanced performance engine
EPR	Engine pressure ratio
EQUIP	Equipment
EST	Estimated
ET	Elapsed time
EU	Electronic Unit
EXT	External
EXTD	Extend

F

FCCA	Flight control computer A
FCCB	Flight control computer B
FCES	Flight control electronic system
FCF	Functional check flight
FCS	Flight control system
FE	Fighter escort configuration
FF	Fuel flow
FIRAMS	Flight incident recording and monitoring system
FLBIT	Fuel low BIT
FLIR	Forward looking infrared
FO	Foldout
FOD	Foreign object damage
F-QTY	Fuel quantity
FT	Feet
FUS	Fuselage

G

G	Gravity
GB	Gyro bias
GCU	Generator converter unit
GEN	Generator
GEN TIE	Generator tie
G-LIM	G Limiter
GND	Ground
GPS	Global Positioning System
GRCV	Guard receive
GXMT	Guard transmit

H

HARM	Highspeed antiradiation missile
HDG	Heading
HDG/SLV	Heading slaved
HERR	Horizontal (position) error
HI	High
HI	Horizontal Inidicator
HOOK	Arresting hook
HPWS	High pressure water separator
HSEL	Heading select
HSI	Horizontal situation indicator
HUD	Head up display
HVC	HUD video camera
HYD	Hydraulic
HYD1	Hydraulic system 1
HYD2	Hydraulic system 2

I

IBIT	Initiated built in test
ICAO	International civil aviation organization
ICS	Intercommunication control set
ID	Identification
IFA	Inflight alignment
IFEI	Integrated fuel-engine indicator
IFF	Identification friend or foe
ILS	Instrument landing system
IM	Inner marker
IMC	Instrument meteorological conditions
IMU	Inertial measurement unit
INIT	Initialize or initiate
INOP	Inoperative
INS	Inertial navigation system
INST	Instrument
INSTR	Instrument
INU	Inertial navigation unit
INV	Invalid
I/P	Identification of position
IR	Infrared
ISOL	Isolate

J

JETT	Jettison

K

KIAS	Knots indicated air speed

L

L	Left
LAT	Latitude
L ACC	Lateral accelerometer
L BAR	Launch bar
LBA	Limit basic aircraft
LDDI	Left Digital display indicator
LDG	Landing
LED	Light Emitting Diode
LEF	Leading edge flaps
LEX	Leading edge extension
LG	Landing gear
LI	Left inboard
LMDI	Left multipurpose display indicator
LO	Left outboard
LO	Low
LONG	Longitude
LPU	Life preserver unit
LRU-23/P	Liferaft
LT	Light
LTOD	Local time of day

M

MAC	Mean aerodynamic chord
MAD	Magnetic azimuth detector
MAGR	Miniaturized airborne GPS receiver
MAGVAR	Magnetic variation
MAX	Maximum thrust
MC	Mission computer
MDC	Mission data loader
MECH	Mechanical link
MER	Multiple ejector rack
MFS	Multifunction switch
MIL	Military thrust
MM	Middle marker
MMP	Maintenance monitor panel
MPCD	Multipurpose color display
MSDRS	Maintenance signal data recording set
MTRS	Meters
MU	Memory unit
MUMI	Memory unit mission initialization
MUX	Multiplex bus
MVAR	Magnetic variation

N

N1	Fan RPM
N2	Compressor RPM
NH	Engine compressor high pressure turbine speed
N ACC	Normal accelerometer
NABITS	Non-avionic built in test
NACES	Navy aircrew common ejection seat
NAS	National air space
NATOPS	Naval air training and operating procedures standardization
NAV	Navigation
NAV CK	Navigation check
ND	Nose down
NM	Nautical miles
NORM	Normal
NOTAMS	Notice to airmen
NOT RDY	Not ready
NOZ	Exhaust nozzle position
NU	Nose up
NVD	Night vision devices
NVG	Night vision goggles
NWS	Nosewheel steering

O

OAP	Offset aim point
OBOGS	On board oxygen generating system
OFP	Operational flight program
OIL	Engine oil pressure
OM	Outer marker
ORIDE	Override
OTG	Operational tactical guides
OVFLY	Overfly
OVRSPD	Overspeed
OXY	Oxygen

P

P	Pitch
PCL	Pocket checklist
PIO	Pilot induced oscillation
PLF	Parachute landing fall
PNL	Panel
POS	Position
PR	Pressure
PROC	Processor
PROM	Programmable read only memory
PSI	Pounds per square inch
PTTI	Precise time and time interval
PVT	Position, velocity, and time
PVU	Precision velocity update

Q

QTY	Quantity

R

R	Right
R	Roll
RALT	Radar altimeter
RCDR	Recorder
RCVY	Recovery
RDC	Right digital display indicator
RDR	Radar
REC	Radar elevator control
RECCE	Reconnaissance
REJ	Reject
RI	Right inboard
RLG	Ring laser gyro
R-LIM	Roll rate limiter
RMDI	Right multipurpose display indicator
RNG	Range
RO	Right outboard
ROC	Rules of combat
ROE	Rules of engagement
RPM	Revolutions per minute

R

RSET	Reset
RSRI	Rolling surface to rudder interconnect
R/T	Receive/Transmit
RTC	Real time clock
RTN	Return
RUD	Rudder
RWR	Radar warning receiver

S

SA	Situational awareness
SARI	Standby attitude reference indicator
SDC	Signal data computer
SDC	Signal data converter
SEAWARS	Seawater parachute release mechanism
SEQ	Sequence
SIF	Selective identification feature
SJU-17	Ejection seat
SKU-10/A	Seat survival kit
SMS	Stores management set
SOP	Standard operating procedures
SPD	Speed
SPD BRK	Speed brake
SPN	Spin
SRM	Spin recovery mode
STAB	Stabilator
STBY	Standby
STD HDG	Stored heading
SUPT	Support
S/W	Software
SW	Switch

T

T1	Engine inlet temperature
TAC	Tactical
TAS	True air speed
TCN	TACAN
TDC	Throttle designator controller
TDP	Turbin discharge pressure
TDU-32/B	Aerial banner target
TEF	Trailing edge flaps
TEMP	Temperature
TGT	Target
TK PRESS	Fuel tank pressure
T/O	Takeoff
TOT	Time on target
TRU	Transformer-rectifier unit
TTG	Time to go

U

U BATT	Utility battery
UFC	Upfront control
UHF	Ultra high frequency
UNLK	Unlock
UPDT	Update
UTC	Universal coordinated time
UTM	Universal transverse mercator

V

VDC	Volts, direct current
VEL	Velocity
VER	Vertical ejector rack
VERR	Vertical (position) error
VFR	Visual flight rules
VHF	Very high frequency
VHS	Video home System
VIB	Vibration
VMC	Visual meteorological conditions
VOL	Volume
VOR	VHF omnidirectional ranging
VSH	Video sensor head
VTRS	Video tape recording system

W

W	Waterline symbol
W DIR	Wind direction
WGS	World geodetic survey
W SPD	Wind speed
WARN	Warning
WDSHLD	Windshield
WOW	Weight on wheels
WOWB	Weight on wheels both
WSO	Weapons and sensors officer
WYPT	Waypoint

X

X	Control surface inoperative
XFER	Transfer

Y

Y	Yaw
YDS	Yards

Z

ZTOD	Zulu time of day

Credits

- Eric 'Aeyes' de Best – 2D/3D Cockpit textures, 2D cockpit functionality, 3D cockpit model design, loading and leaving 'splashscreens', ejected pilot model and textures, manual, quality checks
- Stefano 'Qawa' – 3D model conversion to DXM, ejected pilot animations and conversions, 3D cockpit functionality, animations and clikability, quality checks
- JanHas – Aircraft external textures, JHMCS helmet model and texture, quality checks
- Mike 'Homercide' Hom – Installer

Carrier stories

- **Ring Wraigth** – Naval Aviator Story
- **Shadow** – Carrier Landing

US Navy pictures
Mass Communication specialist 1st Class John M. Hageman
Mass Communication Specialist 2nd Class Joseph M. Buliavac
Mass Communication Specialist 3rd Class Torrey W. Lee
Mass Communication Specialist 3rd Class Gary Prill
Mass Communication Specialist 3rd Class Jon Hyde
Mass Communication Specialist 3rd Class Brandon C. Wilson

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FreeFalcon 5.0
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